ELECTRICAL REVIEW

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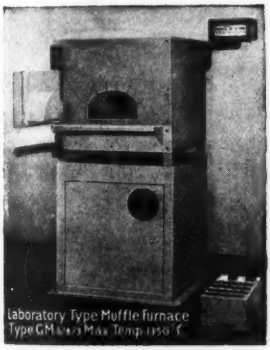

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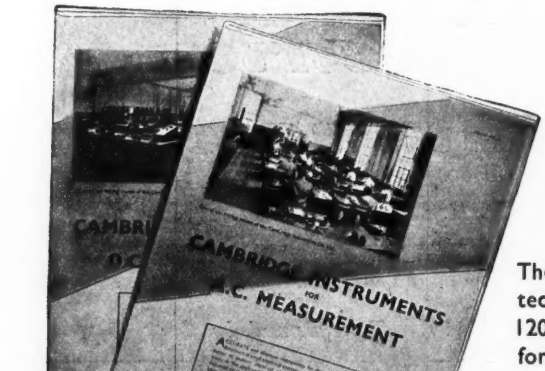

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ELECTRICAL REVIEW

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A.C. in Ships

ADMIRALTY EXPERIMENTAL INSTALLATIONS

MOST shipowners run their vessels solely on a commercial basis. Changes in design do not therefore concern them much unless they are likely to better the performance of the ship, or merit consideration for some other equally valid reason. The trend towards the more economical running of ships, which had become increasingly evident between the two wars, brought to the fore the need for selecting the most suitable auxiliary machinery. This necessity led to increasing employment of electric power and stimulated the development of auxiliaries specially designed for combination with driving motors.

Satisfactory D.C. Operation

Most electrical auxiliaries have been built to suit d.c. at 110 and later 220 V; the speed of motors can readily be varied, by shunt or series control, over a fairly wide range and any trouble in service has resulted mainly from the burning of commutators, overheating of windings due to deposition on them of oil-laden vapour and burning of contacts in motor starters. The equipment is otherwise entirely satisfactory and, moreover, its performance compares favourably with that of steam-driven auxiliaries. That is usually the only basis on which marine plant is judged.

Nevertheless in expectation of the eventual introduction of a.c., the I.E.E. and the marine classification societies long ago established rules for its employment for propulsion and/or auxiliary power as well as for heating and lighting in all types of vessels. Frequencies have ranged from 36 to 80 c/s and since the war up to 100 c/s for refrigeration plant. From 2,000 to 7,500 V is permissible for propulsion with from 120 to 450 V for general services, differing according to service and country of classification.

Ships' a.c. installations are, however, still sufficiently uncommon to call for special mention and the subject has since the war been very much in the minds of marine engineers. Particular interest will therefore be aroused by the news, received officially from the Department of the Chief of Naval Information at the Admiralty, of the decision made some time ago after full consultation with the electrical industry, to equip four destroyers with a.c. at 440 V, 60 c/s, three-phase instead of d.c. which so far has been employed in British warships.

No Radical Changes

The change-over from d.c. to a.c. should not necessitate any radical changes in types of auxiliaries employed. It will mean, in general, that they must run at fixed speeds because the reduction of a.c. motor speeds can only be arranged for by some sacrifice of efficiency. The exceptions are those cases in which pole-changing motors can be utilized.

It is true to say that deck machinery, particularly winches and windlasses, is not easy to convert, but a.c. types were built in Germany during the war and experiments are proceeding in America, while the provision of motor-generators for special circuits is not unknown.

One of the definite advantages of a.c. in marine service is the ease with which the low voltages favoured for lighting in ships may be obtained cheaply through step-down transformers. Large installations may be cheapened by division into convenient sections, each served by its own transformer for greater reliability. The three-phase source can be split into three lower-voltage circuits for single-phase heating purposes. Turbine ships employing steam at high pressure and oil-engine vessels have shown that electrically driven auxiliaries, though they may cost more to purchase, are normally much cheaper to operate than equivalent steam-driven auxiliary machinery.

FUTURE PLANT CAPACITY

THERE is some vagueness in the section of the White Paper on Great Britain's part in European co-operation which deals with the provision of generating plant. It is stated that the aim is to increase the available capacity of thermal generating plant by 40-50 per cent above the present amount by 1953. It is by no means clear what the present availability of plant is or how much of it will still be serviceable in 1953 and so it is an uncertain basis. It is no easier to gain an idea of the actual expansion contemplated from the estimate of expenditure. The figure of $2,000 million quoted covers not only generating plant but "ancillary work in transmission lines and distribution." The one substantial figure given is 600 MW as the capacity of the plant to be installed by the North of Scotland Hydro-Electric Board.

PERFORMANCE COMPARISONS

So long as prices and costs continue to lack stability, it will not be easy to compare present performance with standards of the past. Nevertheless, the annual report of the Diesel Engine Users' Association on heavy-oil engine generating plant does set out many of the principal factors which affect operation in a most useful way. The information contained in this report, which enjoys a world-wide circulation, is not readily available elsewhere or in so convenient a form. It would be a pity if its value were to be diminished by lack of suitable returns. Notwithstanding an increasing membership, few of the new members seem to be making any contribution to the report, which is a matter for general regret and of concern to the Association.

MOTOR EXPORTS

LAST June the Ministry of Supply told electric motor manufacturers that they were free to resume the unrestricted export of fractional h.p. machines but that the home demand for motors of between one and 50 h.p. was still unsatisfied and therefore exports of these sizes must still be limited. Since then the position has so much improved that the Ministry has been able to inform makers that they may now freely sell these motors abroad, provided that they continue to pay first regard to the needs of the home market. They are also asked to concentrate their efforts first on hard currency markets and secondly on countries in the sterling area.

HOUSING FOR "KEY" MEN

IN last week's leading article reference was made to the housing shortage as one of the difficulties in speeding up power station construction. In this connection it is of interest to record that at Brighouse (Yorks) the Corporation has agreed to allot fifty houses to employees of J. Blakeborough & Sons, the valve manufacturers, who are being taken on for an extension of the company's works. The townspeople will not suffer as the Ministry of Health has sanctioned the erection of additional Corporation houses at Brighouse to meet the situation thus created.

GAS-STEAM GENERATION

FROM time to time it has been suggested that the most economic use of the gas turbine might be in combination with steam. On page 1032 Col. Ernest Mercier describes the equipressure system which, as the result of the successful running of a pilot plant at the Vitry power station, near Paris, is being embodied in a full-scale commercial unit. In addition to showing high thermo-dynamic efficiency, with the advantages of saving in material and space, the system appears to be flexible enough for adaptation to a wide range of local conditions, depending on the relative costs of coal and oil.

Water Power Developments

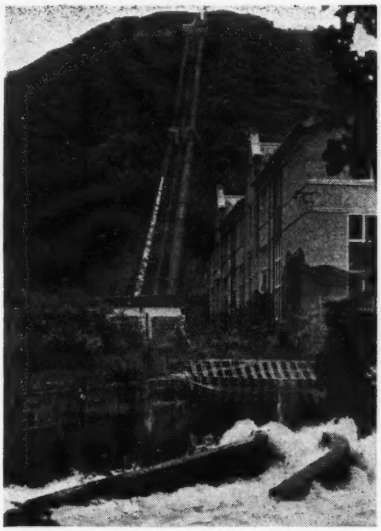
NORTH WALES PROPOSALS : TWO SCOTTISH STATIONS COMPLETED

PRIOR to the vesting of most electricity undertakings in the British Electricity Authority the former North Wales Power Co. had obtained from its consulting engineers, Freeman, Fox & Partners and Mr. James Williamson, a report on possible further development of hydro-electric power in what is now the Merseyside and North Wales Division of the B.E.A.

The consultants proposed the extension of the existing catchment areas of the Dolgarrog and Maentwrog stations (see *Electrical Review*, 20th August, 1948, p. 273) with the installation of additional generators for the former but not the latter. Six major projects were also recommended along with certain minor plans which merited further study.

Key map of major North Wales hydro-electric projects and extensions of existing generating plant

None of the consultants' recommendations had been acted upon on 1st April, 1948, since when the construction of leets and tunnels for the Dolgarrog scheme has been put in hand and plant installation investigations are proceeding. The enlarged catchment should produce an additional 14 million kWh/annum in a year of average rainfall. The estimated cost of £283,000 excludes that of purchasing additional generating plant.



The Dolgarrog Station generating plant will be extended

Surveys in hand for extending the Maentwrog catchment indicate an increased output of 22 million kWh/year at an estimated cost of £340,000.

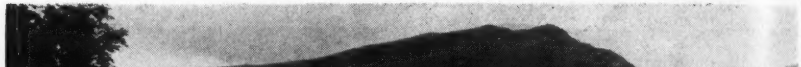
For the first of the major projects (areas marked 1 on the map) the proposal is to utilize the high ground of the Upper Conway and Afon Machno as water collecting areas for two power stations at different elevations. The proposed situation of the lower station of the two would be near the junction of the River Conway with the Afon Lledr. In an average year a total output of 108 million kWh is expected.

In the second case (areas marked 2 on the map) the Afon Mawddach and also tributaries to the west flowing to the River Eden would be utilized through three power stations situated at varying elevations and it is estimated that in an average year 89 million kWh would be generated.

The third scheme (area 5 on map) would utilize the heights of Plynlimon in mid-Wales as a gathering ground and water collected in the Afon Rheidol would be used through three power stations. The lowest of the group would be situated to the westward on the River Dovey into which it would discharge near sea level. It is estimated that the average annual output of these stations would be 128 million kWh.

In the Snowdon area (marked 4 on map) a small power station at Cwm Dyli taking water from Llyn Llydaw in the Snowdon Range and discharging to the Afon Glaslyn, already exists. The present gathering point in Llyn Llydaw for this station would be diverted to a new power station and Cwm Dyli would receive its pressure water from an area farther to the north. In this scheme five power stations are proposed with a total average annual output of some 88 million kWh.

The fifth scheme (area 5 on map) would utilize the water run-off from some of the hill ranges in the Blaenau Ffestiniog area. Three power stations are proposed with a total average yearly output of about 45 million kWh.



The catchment area serving this station (Maentwrog) is to be increased

The sixth proposal for an area south east of Bethesda (area 6 on map) would make use of Llyn Idwal ad Llyn Ogwen as local storages. The water in these storages, which would be augmented by diverted water, would be utilized in a power station to be installed in the valley of the Nant Ffrancon. Two stations are proposed in this instance with the second and larger near sea level in Conway Bay near Aber. Tunnels would convey the pressure water from a reservoir formed in the valley of the Nant Ffrancon to this power station. It is estimated that the combined stations would have an average annual output of 61 million kWh.

The cost of the six major schemes as estimated by the consulting engineers, with adjustments for present day prices, would be approximately £20 million for a total estimated annual output of about 520 million kWh.

The importance of preserving amenities during construction of the various schemes will receive the most careful consideration.

Morar and Lochalsh Schemes

THE North of Scotland Hydro-Electric Board has recently completed and put into operation the first two of its hydro-electric stations — one at Morar, Inverness-shire, and the other at Lochalsh, Ross-shire. They are both small, but their output will be most useful at the present time and perhaps their major significance lies in the fact that these represent the first contributory part of the Board's comprehensive generation programme.

The Morar station is believed to be the first underground generating station to be built in Great Britain. It has been constructed inside a cavern, hewn out of a knoll of solid rock beside the River Morar. The Lochalsh scheme has resulted in the creation of a new loch in the hills roughly 500 feet above Loch Alsh. The generating station building at Nostie Bridge is of traditionally Scottish design, with its local hammer-dressed stone and low-pitched roof covered with heavy slab slates.

The Morar station will serve 90 per cent of the people in an area of roughly 71 square miles, comprising the seaboard district of Inverness-shire and extending approximately from Mallaig to Kinlochailort. It is situated on the River Morar on the west coast of Inverness-shire, and the present plant capacity is limited to 600 kW. The designed ultimate capacity, however is 2,000 kW, with the production of six million kWh annually. Loch Morar is 11 miles long and is the deepest loch in Scotland. In order to obtain storage and to increase the head, the scheme provides for raising the level of the loch from 31ft O.D. to 40ft O.D., but meantime the level is being raised to 34ft O.D. by means of an automatic regulating weir erected on concrete foundations in the river bed immediately above the Morar Falls.

The power house excavation down to the level of the turbine foundations required the removal of 1,800 cu yd of rock. The finished size of the power house is 30ft long, 18ft wide and 34ft high above the main floor. The generating plant comprises two vertical Kaplan turbines, each driving a 300 kW alternator at 333 r.p.m.

After the completion of the power station intakes, a coffer dam was placed across the river and the water diverted to flow through the tunnels and turbine pits into the river below the falls. Behind this coffer dam the foundations for the regulating weir were built into solid rock below the natural river bed level. In this way, when the weir is lowered, the river is able to flow

(Above) The Morar regulating weir will maintain a steady water level and prevent flooding. (Left) The Allt Gleann Udalain dam is 250 ft long

as formerly. The "drum-gate" regulating weir will maintain a steady water level and at the same time prevent flooding, adjusting itself automatically to the flow from the loch, and when there is a flood it will open fully and thus cause no obstruction. It is controlled by means of a valve which passes water into a chamber beneath the weir, causing the gate to rise as the level of water in the loch decreases and fall when the level in the loch rises.

The consultants for the Morar project were J. & A. Leslie & Reid (civil engineering) and Merz & McLellan (electrical). The architect was Dr. Reginald Fairlie. The contractors were Whatlings, Ltd. (civil engineering); Glenfield & Kennedy, drum-gate and sluice gates; Bruce Peebles, Ltd., turbo-alternators; Boving & Co., Ltd., turbines; Bonar Long & Co., Ltd., transformers; Cooke & Ferguson, Ltd., 11-kV switchgear and associated equipment.

The Lochalsh station will supply an area stretching in the north from Applecross and Shieldaig in Western Ross-shire, southwards to Glenelg and Arnisdale in Western Inverness-shire and westwards into parts of the Isle of Skye. The constructional work has included a dam about one mile up Gleann Udalain, 56ft high and 250ft across the Allt Gleann Udalain, and erection of a pipeline 5,230ft long. The station has a present capacity of 1,000 kW, but the designed ultimate capacity is 4,000 kW, with an estimated annual output of 7 million kWh. The plant operates under a maximum gross head of 478ft. The station is built of local stone and red Torridonian sandstone from Skye. Measuring 57ft by 32ft, it houses two 21in Gilkes "Turgo" impulse 750 r.p.m. turbines, each coupled to a 500 kW alternator.

The consulting engineers for the civil engineering work were Sir Wm. Halcrow & Partners, and for the plant and machinery Kennedy & Donkin. Mr. James Shearer, of Dunfermline, was the architect. The main contractors were Richard Costain, Ltd. (civil engineering); Crompton Parkinson, Ltd., switchgear and ancillary gear; Gilbert Gilkes & Gordon, turbines; Bruce Peebles & Co., Ltd., alternators; Bonar Long & Co., Ltd., transformers; Horseley Bridge & Thomas Piggott, Ltd., pipeline; and the Wharton Crane & Hoist Co. crane.

Further Scottish Projects

DETAILS regarding the plant which will be installed at Sloy, Shira, Lawers and Pitlochry were given in a paper on "Water Turbine Machinery" by Mr. A. A. Fulton, of the North of Scotland Hydro-Electric Board, read before the Institute of Engineers and Shipbuilders in Scotland.

Water turbine machinery at Sloy, he said, would consist of four vertical-shaft high-head Francis turbines with an output of 45,000 b.h.p. each. The turbines would be capable of running at a speed of 428 r.p.m. Gross head would be 910ft and when under load the turbines would operate under a head varying from 810 to 880ft. They would have spiral casings of steel, cast in one piece.

A similar installation would operate at Shira, but the head would be higher at 950ft gross. There would be an average operating head of 910ft and output would be 56,000 b.h.p., which would make the Shira installation the largest single water turbine so far to be erected in Great Britain. At Lawers there would be only one set, the water turbine being of the Pelton type. Gross head, so far the highest in any of the Board's schemes, would be 1,348ft and the average working head 1,290ft. The rated output of the set would be 42,000 b.h.p., and its speed 375 r.p.m. The turbine would be of the double overhung type having two runners, one at each end of the horizontal shaft of the generator, each runner being supplied with water from two jets.

The Board was to install at Pitlochry two Kaplan turbines, each of 10,500 b.h.p. capacity, operating under a maximum head of 55ft, which would be the first of several examples of Kaplan turbines the Board intended to install.

The balancing of cost against maximum possible output determined not only what savings in civil engineering construction had to be set against output lost in friction in water passages, but was the incentive which demanded the highest possible running speed. Within the limits of speed usual for water turbines not only did the size of the generating set—and usually its cost— decrease with increase in speed, but also the size of the station and all the various items which were a function of the diameter of the main machinery.

Developments in Broadcasting

IN his presidential address delivered before the Junior Institution of Engineers in London recently, SIR NOEL ASHBRIDGE reviewed the latest developments in television and ultra-high-frequency broadcasting. He said that in itself television was not new, but from the view of technical finality it was still in its early stages and could therefore be regarded as a recent development.

After outlining some of the factors affecting video transmission, he briefly referred to the existing station in London and the one at Sutton Coldfield which will serve the Birmingham area and have a peak vision transmission power of 35 kW, double that of the Alexandra Palace transmitter. He then discussed picture quality and definition, comparing the British and American systems, followed by colour television, in which field major developments are unlikely to be made for many years.

Passing to u.h.f. broadcasting, Sir Noel outlined its general principles together with the benefits of frequency modulation in comparison with amplitude modulation. In conclusion he mentioned some other lines of research which the B.B.C. is pursuing, such as in the field of studio acoustics, audio frequency equipment and in recording apparatus.

Electricity on the Farm

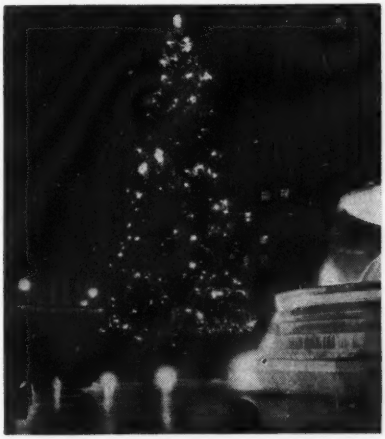
AT a recent meeting of representatives of the National Farmers' Union from Caernarvon, Montgomery, Merioneth, Anglesey, Flint, Denbigh, Cheshire, and Shropshire, at headquarters of the Merseyside and North Wales Electricity Board in Liverpool, Mr. J. Eccles, chairman of the Board, said that the Board had now reached the stage of considering detailed schemes for the rural electrification of counties in its area, and it was hoped by next spring to begin by developing schemes simultaneously in each county.

In due course every farm in North Wales would have electricity offered it, but he warned the farmers' representatives that even if the Board could get materials at four times the present rate, and recruit a labour force four times the present strength, the total scheme could not be completed in less than twenty years. The rate of development would depend on the availability of money for capital development, materials and skilled labour force.

The farmers assured Mr. Eccles that they would make the greatest use of electricity when it became available, and they would co-operate fully with the Board in its plans for development. Mr. W. A. H. Parker, electricity consultant to the N.F.U., said he welcomed the project as the first planned scheme of its size in the country. There were over 35,000 holdings of five acres or more, and only 7,000 had electricity in 1942. The estimated cost of supplying the farms alone, without taking into account cottages and other buildings, was nearly £9 million.

Trafalgar Square Illuminations

LARGE crowds have been attracted to Trafalgar Square, London, over Christmastide to see the illuminated Christmas tree and floodlit fountains. The 64 ft tree, presented by the people of Norway, is decorated with 350 "Osram" coloured



Trafalgar Square Christmas Tree, with one of the illuminated fountains

lamps and is surmounted by a star-shaped fitting (see *Electrical Review*, 17th December, p. 956). The illuminations will continue until Twelfth Night.

Government Cable Drum Specification

A REVISED version of G.D.E.S. 20-1948 for cable drums has been issued by the Committee on the Standardization of Electrical Cable & Wires for Government Services (Secretary: Ministry of Supply, I.E.M.E., "Walsingham," Chislehurst, Kent). The specification now includes a preferred list of drums in addition to a table of design details. Other changes have been made in the text. Copies are obtainable from H.M. Stationery Office, price 3d.

Views on the News

By REFLECTOR

I HAD the opportunity last week of seeing a demonstration of large screen television for cinemas given by Cinema Television, Ltd. Apart from the remarkable technical progress evidenced I could not help feeling also what a strong endorsement it was of the decision of the Television Committee to standardize on 405 lines. If the definition was satisfying when projected on to a screen 16ft x 12ft, Christopher Stone might well say to the Television Committee "How right you were!"

★ ★ ★

Recently representatives of the Dean and Chapter of St. Paul's Cathedral paid a visit to the site of the new Bankside power station over the river. They are stated to have shown great interest in the work being done there. After all the discussion there has been on the possible effect upon the cathedral of fumes from the new station it is pleasing to hear of this friendly visit. Most of the vociferous protests appear to have come from "third parties."

★ ★ ★

I am reminded that the January issue of *Registration*, the little periodical issued by the National Register of Electrical Installation Contractors, marks the completion of the journal's second year. Its purpose is mainly educational. Every issue contains practical notes on installation technique, particularly the interpretation of the I.E.E. Regulations. These are largely the work of Mr. F. W. Purse, the hon. director of the Register, who throughout his long career in electricity supply made the provision of sound installations one of his principal aims.

★ ★ ★

People unacquainted with the trade Press are apt to comment upon the large proportion of advertising pages to editorial. They do not realize that the advertisements form an essential part of these papers and are not merely endeavours to part readers and their money, as is often the case in "lay" journals. This point was stressed by Mr. Geoffrey A. Shiris in a recent lecture to the Association of Special Libraries and Information Bureaux, when he said that the advertisement pages of a trade journal were "a legitimate quarrying ground for an information service." In these days of space shortage they form an even greater supplement to the information published in the editorial section.

★ ★ ★

Reference was made in my notes of 10th December to the denial of the British Electricity Authority that it proposed to sell electric lamps. It was made clear, however, that the Electricity Boards were free to engage in the business. Now I find that at least one of the Boards is actively soliciting orders for lamps. Consumers are receiving with their bills a business reply card in which they can indicate the number, wattage and type of lamps which they require, the cost being charged to their accounts.

★ ★ ★

Advantages that may follow the substitution of plastic material for metal are very apparent in an American electric fan which I recently had the chance of inspecting. By employing moulded phenolic plastic instead of cast aluminium for the blade the manufacturer halved not only the weight but also the cost, at the same time eliminating noise and vibration. He also secured the same performance with a lower horse-power motor. Phenolic plastic was also used for the motor cover and the base of the fan.

★ ★ ★

It is appropriate for a man who carries out repairs to aircraft electrical equipment to employ air travel in the pursuit of his business. Mr. P. L. Chadwick (Ray Electricals, Ltd.), of Folkestone, has dealings with a number of civil aerodromes and last year acquired an ex-Army "Auster" spotter in which he visits his clients and collects equipment for repair. He claims that his expenses are no greater than if he used a motor van, and aims at extending his range to the Channel Islands and the Continent.

Scott-Connected Transformers

TWO-PHASE TO THREE-PHASE CONVERSION

By G. W. STUBBINGS, B.Sc., A.M.I.E.E.

THE most general use of two Scott-connected transformers is to obtain a two-phase supply from a three-phase system. Most textbooks explain how, given the output on the two-phase side, the characteristics of the three-phase input can be obtained. The reverse conversion is sometimes employed, but the vectorial representation of the two-phase input for various conditions of three-phase output loading is rarely dealt with and occasions some difficulties to students.

If the two-phase voltages and the three-phase line voltages are assumed to be equal (Fig. 1) the voltage transformation ratio in the main transformer is 1 : 1 and that in the teaser transformer is $1 : \sqrt{3}/2$, the teaser being connected to a mid-point tap O on the main transformer, on the secondary three-phase side. A one-third tap N on the teaser secondary, reckoned from the terminal O, forms the neutral connection for the three-phase output.

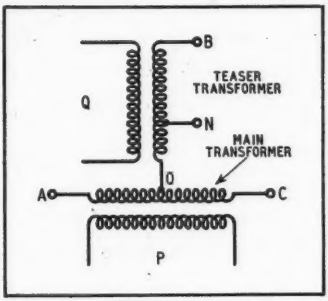


Fig. 1. Scott connected transformer windings

When the primary windings of the two transformers are energized at equal voltages in phase quadrature on the two-phase side, a set of unsymmetrical star voltages (Fig. 2a) acting from the point O in the secondary winding will be set up. If V is the magnitude of the equal primary voltages, then the voltage V_{OB} acting in the secondary winding from O to B, will be $\frac{\sqrt{3}}{2}V$ in magnitude and in phase with one of the primary voltages. Similarly V_{OA} and V_{OC} are the vectors of the voltages acting from the tapping at O towards the terminals A and C. Each is $\frac{1}{2}V$ in magnitude. The vectors are in phase opposition because they act in opposite directions and each is in phase quadrature with the voltage V_{OB}. If (as shown in Fig. 2a) the reverse of the vector V_{OC} is compounded with the vector V_{OB}, the resultant V_{BC} represents the voltage acting from B to C in the external circuit. The magnitude of this resultant voltage is plainly $V\sqrt{\left[(\frac{1}{2})^2 + \left(\frac{\sqrt{3}}{2}\right)^2\right]} = V$ and it is 120 deg. out of phase with V_{OC}.

Proceeding on similar lines, one obtains the triangle of equal line voltage vectors (Fig. 2b). Had the voltage V_{OC} been compounded with the reverse of V_{OB}, the vector of the voltage acting from C to B in the external circuit would have resulted and it would have been the reverse of the vector V_{BC}. The cyclic line voltages obtained by proceeding similarly would have been V_{CB}, V_{AC} and V_{BA}, the reverse of those in the diagram.

The voltage in an external circuit acting from terminal A towards the neutral terminal N or V_A is the resultant of the voltage V_{OA} and the reverse of the voltage from N to O in the transformer winding. These component voltages are in phase quadrature, so $V_{ON} =$

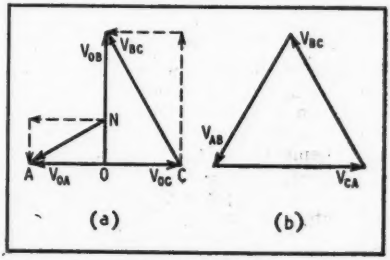


Fig. 2. Vectors for (a) unsymmetrical star and (b) equal line voltages in secondary winding.

$\frac{1}{2}V_{OB} = \frac{1}{2\sqrt{3}}V = \frac{1}{\sqrt{3}}V_{OA}$. The star voltage V_A is therefore $\frac{V}{\sqrt{3}}$ and is 30 deg. out of phase with V_{OA}. It is evident that the three voltages acting from the terminals A, B and C towards the neutral in the external circuits form a symmetrical system.

Now Fig. 3 shows the vectors I_A, I_B and I_C of a system of three-phase output currents without residue; I_B transforms directly in the teaser with a ratio of $1 : \frac{\sqrt{3}}{2}$ and the input current I_Q is therefore equal to $\frac{\sqrt{3}}{2}I_B$. The currents I_A and I_C in the secondary winding of the main transformer set up m.m.f.s.

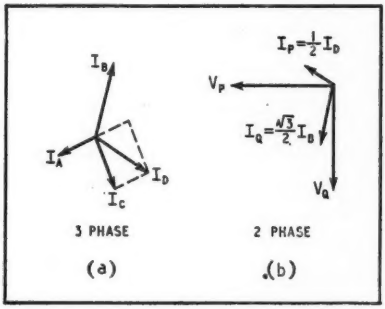


Fig. 3. Current vectors (a) three-phase and (b) two-phase without residue

in opposition, the resultant of which is equivalent to that of I_D, the difference between I_A and I_C, flowing in one half of the secondary winding of the main transformer. The ratio of transformation for this resultant current is therefore $1 : \frac{1}{2}$ so the two-phase input I_Q is in phase with I_D and $\frac{1}{2}I_D$ in magnitude.

This result can be checked by calculating the power input and output for a balanced load of unity power factor carried by equal currents I, ignoring transformer losses. The three-phase output is $\sqrt{3}IV$; the two-phase current I_Q is $\frac{\sqrt{3}}{2}I$ and in phase with the two-phase voltage. Since $I_d = \sqrt{3}I$ then the two-phase current I_P is $\frac{1}{2}I_D = \frac{\sqrt{3}}{2}I$, also in phase with the corresponding

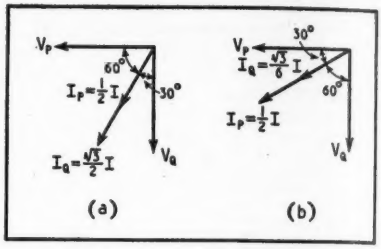


Fig. 4. Current input vectors for single-phase loading (a) between lines and (b) between line and neutral

voltage. The two-phase power is therefore $\frac{\sqrt{3}}{2}IV + \frac{\sqrt{3}}{2}IV = \sqrt{3}IV$.

Two cases of single-phase loading on three-phase side may be briefly considered. First assume that a single-phase supply at unity power factor is taken off between terminals A and B. This current I will be 30 deg. out of phase with the voltage in the teaser and 60 deg. out of phase with the voltage in the main transformer. The current transformation ratio in the teaser will be $1 : \frac{\sqrt{3}}{2}$ and in the main transformer it will be $1 : \frac{1}{2}$, since the output current flows in one half of the winding only. Hence the two-phase input currents will be shown in Fig. 4 (a). One can check this result by calculating power, ignoring the transformer losses. The three-phase power is IV and the two-phase power is $\frac{1}{2}IV\cos 60 + \frac{\sqrt{3}}{2}IV\cos 30 = IV.\ (\frac{1}{4} + \frac{3}{4}) = IV$ which is correct.

If a single-phase load at unity power factor is imposed between A and neutral on the three-phase side, the output current flowing from N to O will be 60 deg. out of phase with the two-phase voltage and will transform with a ratio of $1 : \frac{1}{2} \times \frac{\sqrt{3}}{2} = 1 : \frac{\sqrt{3}}{6}$ since the current flows through one third only of the transformer winding on the secondary

side. Therefore $I_Q = \frac{\sqrt{3}}{6}I$. The same output current flowing from O to A in the main transformer winding will be 30 deg. out of phase with the main transformer voltage and it will transform with a ratio of $1 : \frac{1}{2}$. Therefore $I_P = \frac{1}{2}I$. As before one can check the result by calculating input and output power.

The three-phase power is $\frac{IV}{\sqrt{3}}$ and the two-phase power is $\frac{\sqrt{3}}{6}$ IVcos 60 + $\frac{1}{2}$ IVcos 30 = IV $\left(\frac{\sqrt{3}}{12} + \frac{\sqrt{3}}{4}\right)$ = IV × $\frac{\sqrt{3}}{3} = \frac{IV}{\sqrt{3}}$ which is correct.

If the single-phase load is taken between terminal C and the neutral, the currents on the two-phase output side will be the same in magnitude as those represented in Fig. 4b, but in this case I_P will lead 30 deg. and I_Q will lag 60 deg. on the corresponding voltages. The VAr in phase P of the primary are $\frac{1}{2}$IV sin 30 = $\frac{1}{4}$IV. The VAr in phase Q are $\frac{\sqrt{3}}{6}$IV sin 60 = $\frac{3}{12}$IV = $\frac{1}{4}$IV. These equal VA_r, the one leading and the other lagging, give a zero resultant thus confirming that the two-phase input is of unity power factor.

E.R.A. Publications

THE undermentioned technical reports on investigations conducted by the British Electrical and Allied Industries Research Association have been released for publication at the prices stated, plus 3d postage in each case.

L/T.168. "Recording of Impulse Voltages," by H. Tropper (15s 6d), indicating the errors which may occur when a resistance potential divider and a delay cable are used for oscillographic recording.

L/T.178. "Breakdown Time of Amorphous Solids," by J. H. Simpson (9s 6d), explaining how Fröhlich's theory may be verified and why it is essential to calculate the time so that the electrical stress can be applied for a period several times that necessary for breakdown.

L/T.180. "Initiation of Long Electrical Discharges II—Charging Currents," by C. E. R. Bruce (2s 6d), showing how the ideas developed in the author's previous report (S/T.44) can be applied to the long laboratory spark.

L/T.185. "Structure and Dielectric Properties of Barium Titanate and Similar Compounds," by A. F. Devonshire (7s 6d).

Malayan Plant Shortage

RAPID rehabilitation of industry and the availability of a large quantity of small domestic appliances imposed a heavy demand on the Malayan Union Electricity Department during 1947. In the Kuala Lumpur district alone, where the capacity of the Bungsar station was limited by boiler plant to only 9,000 kW, the waiting list represented a potential load of 27,000 kW. Fortunately, although operating conditions were difficult, an almost uninterrupted output was maintained and altogether 70.8 million kWh was generated. Nevertheless, restrictions had to be continued and load shedding imposed.

It is hoped to have an additional 10,000 kW of plant available by the end of this year, but the position is likely to remain critical until the Connaught Bridge station at Klang, with two 20,000-kW sets, is commissioned at the end of 1950. For the more distant future, there is the possibility of an ambitious scheme of hydro-electric development in the Cameron Highlands where by harnessing the Telom and other rivers a capacity of 100,000 kW at normal flow may be provided in two high-head stations.

During the year five boilers at Bungsar were converted to oil firing by the power station staff and each boiler was completely overhauled, a task which entailed considerable improvization owing to the lack of materials. Firebricks from burned-out boilers were re-used, and baffle bricks were moulded from a mixture of granulated firebrick and fireclay. Ingenuity of another kind was a source of considerable trouble; the report mentions that a large number of persons who obtained electricity in an unorthodox manner were prosecuted.

Throughout its area the Department generated or purchased 102.5 million kWh and sold 80 million kWh, about half of which was supplied to large power consumers such as dredges and opencast mines. There was a net financial surplus on the year's working of $237,899 (£27,755). Income per kWh sold ranged from 3.04 cents (0.85d) in the case of large power consumers to 24.11 cents (6.75d) paid by small lighting consumers.

In the absence of Mr. F. P. Egerton, M.I.E.E., Director of Electricity, in England, the report is presented by Mr. T. E. R. Morphy, M.I.E.E., Acting Director.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Asynchronous Generators

I WAS interested to read "E. J. B.'s" letter as I have carried out considerable research into the possibility of using the asynchronous generator as a self-excited generator capable of being run independently of a source of fixed frequency, i.e., the mains.

In collaboration with a well-known Scottish firm of plant manufacturers who provided generating plant and works testing facilities, I have been able to demonstrate the practicability of my system of control.

It is planned to install an initial set of this control gear in the near future at Newton Stewart, for use on an asynchronous generator carrying a three-phase unbalanced load.

Apart from being designed to meet the particular circumstances quoted by "E. J. B.," the main objective has been to develop a means for the rapid development of the smaller sources of water power by reducing hydro-generating plant to a very simple form.

There is no doubt that the overall capital cost and maintenance charges will be considerably less than those for synchronous generators and oil-relay governed turbines which have had to be installed in the past in order to facilitate independent generation.

Glasgow, W.2. R. H. LAWRENSON.

Professional Institutions

AT some little risk of being accused of opening old wounds, may I beg the favour of a few lines in order to comment on your editorial of 10th December on "Professional Institutions."

The old adage comes to mind: "If you want to get anything out you must put something in." One feels that this is where many of the Institutions fall short of their aims and objects in these days. The fire of enthusiasm having burnt low, many of their members are content to exist as "book numbers" and sit back enjoying the fruits of other people's labours.

There is no doubt great value in the membership of most Institutions, but it is up to the individuals themselves to enter into, not only the spirit, but the activities of those associations with which they are connected, so that they may become part of an organism and not just a unit in an organization.

There is, however, a feeling abroad that too many organizations are "mushrooming," all trying to cater for their little pet fancies; the identification letters are in consequence losing their meaning and authority. A page could well be taken out of the book of the "Mechanicals" and "Automobiles" who have so recently joined forces, with just a little good will and broadening of principles.

A second point which I feel needs comment concerns your remarks on fitness and ability. While I heartily agree with your statement that membership of a body is desirable as an aid to professional advancement, most will agree that the designations indicate some academic attainment. Let it not be assumed that this in itself is proof of ability to hold down a position, as many employers seem to think. Let it be admitted that "there are still some good fish in the sea," even if they do not possess the outward signs. J. H. M.

Birmingham, 21.

Electricians' Output

YOUR editorial of 17th December contained a section "Electricians' Output" which did not make very pleasant reading for the members of the Electrical Trades Union.

I cannot accept the imputation that electricians have not honoured undertakings given at the date of the agreement granting the last wage increase. The bald statement of the National Federated Electrical Association to the National Arbitration Tribunal, concerning comparative individual productive effort in 1930 and 1948, is too sweeping a generalization, given the variable factors to be considered, to be accepted as an absolute truth. It is also a *non sequitur*, leaving a false impression concerning changes in productivity since 1945.

The Electrical Trades Union is unable

to accept direct responsibility for output, particularly in view of the fact that the operative has no part in the organization of the industry.

The employers' association has always been reluctant to present factual data from which competent estimates of productivity for the contracting industry can be deduced. Despite this, the Electrical Trades Union proposed that the terms of reference of a special wages committee set up in 1947 should include a proposal to examine the possibility of relating wages to production.

On many occasions unsupported statements have been made. In the E.T.U.'s case presented to the National Arbitration Tribunal, Treasury figures, the *Ministry of Labour Gazette* and Ministry of Health Housing Returns, were made the basis of a section covering productivity. Our analysis proves that the period since the end of the war has been one of increasing productivity. The introduction of the 44-hour week in January, 1948, has not reversed this development.

FRANK FOULKES,
General President,
Electrical Trades Union.

Hayes, Kent.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IT is announced by Tube Investments, Ltd., that **Mr. E. Austyn Reynolds, Mr. J. H. Catling** and **Mr. W. T. Bowman** have been appointed executive directors of the new subsidiary company, T.I. Aluminium, Ltd., which has been formed to co-ordinate the administrative, research and marketing organizations of the Group's Aluminium Division, comprising Reynolds Light Alloys, Ltd., Reynolds Rolling Mills, Ltd., and the South Wales Aluminium Co., Ltd.

One of those who took part in a broadcast discussion on "Women in Engineering" in the "Woman's Hour" programme on 16th December was **Miss Lesley S. Souter,** B.Sc., A.M.I.E.E., a member of the scientific staff of the Research Laboratories of the General Electric Co., Ltd., Wembley. Miss Souter graduated in electrical engineering at the University of Glasgow in 1940 and is at present working in the electro-medical field.

Miss Lesley S. Souter

Mr. R. H. Harvey, M.I.E.E., M.I.A.E.E., general manager and chief engineer of Lisbon Electric Tramways, Ltd., for the past twenty years, is retiring at the end of 1948. He will continue to reside in Lisbon, and communications may be sent to him c/o Companhia Carris de Ferro de Lisboa, Santo Amaro, Lisbon.

Mr. J. Rae, Jnr., A.I.M., formerly works director of the Birmingham works of McKechnie Brothers, Ltd., has been appointed a director of the company. He has been with the company for eighteen years. Mr. Rae, with his wife and family, sailed on the *Stirling Castle* on 23rd December for South Africa to take up the position of joint managing director of McKechnie Brothers South Africa (Pty), Ltd., Germiston. Correspondence may be addressed to him at P.O. Box 382, Germiston, Transvaal.

Mr. H. C. Ogden, B.Sc., A.M.I.E.E., senior assistant operation engineer in the Yorkshire Division of the British Electricity Authority, has been appointed system operation engineer of the Division in succession to **Mr. P. G. Hieatt,** M.I.E.E., who has become personal assistant to the divisional controller.

Mr. Hieatt became operation engineer for the Mid-East England and North East England Grid Scheme areas in 1946. He joined the staff of the Central Electricity Board in 1931, having previously served in the Electricity Departments of the Hackney, Croydon, Derby, Rotherham and York Corporations and the Northmet Power Co.

Mr. Ogden, who received his technical education at Manchester University, served on the staff of the Manchester Corporation Electricity Department at Barton power station until 1930 when he became assistant engineer in the operation department at the head office of the Central Electricity Board. In 1942 he was appointed senior assistant operation engineer in the North East England area, and later transferred to the Mid-East England area, retaining the post after vesting day.

Mr. A. D. Church, M.I.E.E., A.M.I.I.A., who, as we recently reported, has resigned from the position of chief engineer, Fens

Sub-Area, Eastern Electricity Board, to become assistant manager in charge of operations to the Public Service Co., Ltd., Kingston, Jamaica, was recently presented with an inscribed gold watch by the staff of the former Beds, Cambs and Hunts Electricity Co., of which he was chief engineer before vesting date, and other friends. The ceremony took place at the New Inn Hotel, St. Neots, and Mr. G. J. Dearman, who presided, said that Mr. Church had been largely responsible for the laying and erection of approximately 1,000 miles of underground cables and overhead lines, and the connection of 29,000 consumers in a sparsely populated area. The presentation was made by Mr. H. C. Waters, former manager of the Edmundsons group in the area, and now deputy-chairman of the Eastern Electricity Board. Presentations were also made to Mrs. Church.

An interesting ceremony took place in the canteen at M.E.M. Works, Birmingham, on 15th December, when **Mr. W. L. Barber,** founder of the Midland Electric Manufacturing Co., Ltd., and present chairman, received a gift

Mr. W. L. Barber, chairman and founder of the M.E.M. Co., inspecting the souvenir album. With him (left to right) are Messrs. O. Anstey, W. Pratt and A. Horton

subscribed for by the employees with twenty-one years' service and over, to mark the fortieth anniversary of the company. The gift took the form of an illuminated album with a pictorial record of the progress of the firm from its original premises in Conybere Street where less than a dozen people were employed, to the present works at Tyseley employing more than 1,300 workpeople. An autographed photograph of each of the subscribers was included in the book and the first three, Messrs. O. Anstey, W. Pratt and A. Horton, actually joined Mr. Barber in 1908. Further long-service awards were made on the same day, including ten recipients of a certificate commemorating the completion of twenty-one years' service, whilst fourteen were admitted to the M.E.M. "Gold Watch Brigade" on completion of ten years' service. The total number of awards for ten years' service to date exceeds 400.

Mr. G. J. Stedman, B.Sc., A.M.I.E.E., A.M.I.Mech.E., who recently resigned from the Colonial Service, has been appointed assistant station superintendent at Bonnybridge power station (South-East Scotland Division, B.E.A.).

Mr. A. H. Langford, director and general manager of Heenan & Froude, Ltd., has been appointed director of three subsidiary companies, Court Works, Ltd., Industrial Waste Eliminators, Ltd., and the New Destructor Co., Ltd.

Mr. D. E. Mutch has been appointed lighting engineer to Courtney, Pope (Electrical), Ltd., in succession to Mr. B. Gurr, who was recently appointed assistant secretary to the Association of Supervising Electrical Engineers. Mr. Mutch has been on the staff of the Lighting Department of Philips Electrical, Ltd., since his release from the Services.

Mr. E. Bruce Ball, M.I.Mech.E. (Glenfield & Kennedy, Ltd.), has been elected chairman of the British Valve Manufacturers' Association in succession to **Mr. J. M. Storey** (Dewrance & Co., Ltd.) who has now held office for two years. Mr. J. M. Storey has been elected vice-chairman of the Association.

Mr. P. J. Houlton has resigned his position as supervising engineer with F. H. Wheeler (Sheffield), Ltd.

Mr. D. M. Wright, a mains engineer of the Southport District (No. 1) sub-area of the Merseyside and North Wales Electricity Board, has been appointed district manager of the Edinburgh Sub-Area of the South-East Scotland Area Board. Mr. Wright went to Southport over two years ago from the Hammersmith Corporation. A presentation was made to him by Mr. W. T. Gann, local engineer and manager at Southport.

Mr. George Gibson, who gave evidence at the recent inquiry at Church House, Westminster, has published correspondence between himself and the Governor of the Bank of England regarding his resignation from the Court of Directors of the Bank. Mr. Gibson has intimated that he does not propose to resign his chairmanship of the North Western Electricity Board.

The annual children's party of the **Britannic Electric Cable & Construction Co., Ltd.,** at Iver was held on 20th December

in the company's new canteen. Over 200 children enjoyed a full programme of professional entertainment and traditional party amusements.

Mr. E. A. Fowler, M.I.E.E., F.I.E.S., is relinquishing his appointment as assistant general manager of Electricity House, Ltd., Bramhope, nr. Leeds, which is controlled by the British Electricity Authority. Mr. Fowler is joining Thorn Electrical Industries, Ltd., as branch director and from January will direct the whole of the company's activities in the North of England, Scotland and Northern Ireland from the Stevenson Square, Manchester, offices.

Mr. E. A. Fowler

Mr. Fowler has held responsible positions in the electrical supply, installation and manufacturing sections of the industry. He is at present a vice-chairman of the I.E.E. North Midland Centre and immediate past-chairman of the I.E.E. Utilization Group and I.E.S. Centre of that area.

Mr. V. Randle, who has been appointed by British Railways as district electrical assistant, Nottingham, started his railway career in the Electrical Engineer's Department of the former Great Eastern Railway in 1916. Since 1945 he has been outdoor electrical assistant at Norton Folgate and Stratford.

At the annual Christmas party of "Diamond H" Switches, Ltd., held at the Star and Garter Hotel, Kew, Surrey, on 22nd December, the employees presented **Mr. C. A. Turner,** managing director, with a crystal bowl. The occasion marked his thirty-fifth year with the company. Mrs. Turner presented emblems to employees with from five to twenty years' service.

Eighteen toy-laden Christmas trees supplemented by gifts of nuts, fruit, and other good things were distributed last week to local children's hospitals, homes and orphanages by the employees of **A. Reyrolle & Co., Ltd.** This spontaneous effort to bring a little extra joy into the hearts of sick and needy children has now become an annual event and has resulted this year in the collection of nearly £2,000 worth of money and gifts.

Children of employees of **Vactric, Ltd.,** had an enjoyable time at the Children's Christmas party, held on 18th December, in the workers' canteen at the Newhouse factory. On arrival, the children sat down to a veritable feast which was followed by a marionette boxing match, community singing and a Punch and Judy show. This was followed by games and the party was brought to an end by Father Christmas presenting each child with a present. The party was made possible by subscriptions received from Vactric employees.

The annual staff dinner and dance of the Birmingham branch of **Electrical Components, Ltd.,** was held on 14th December at the Imperial Hotel, Birmingham, about 120 members of the staff and friends spending an enjoyable evening.

Eight hundred employees of **George Cohen Sons & Co., Ltd.,** of the "600 Group," were entertained by Kenneth Horne and Richard Murdoch (of "Much-Binding-in-the-Marsh") at the Christmas staff dinner held at the Porchester Hall, London, W.2. Representatives of the company were present from many parts of the country.

The directors of **Connollys (Blackley), Ltd.,** Manchester, recently invited all their employees with twenty years or more service with the company to a dinner and social evening in the works canteen. Mr. W. Travis, the chairman, presented certificates of service and awards to one hundred and five members. Among the company's nine hundred workers there are a further hundred with between ten and twenty years' service. The event of the social evening was the appearance of Mr. and Mrs. Wilfred Pickles as guests of the directors.

The social club of **F. Westerman (Wholesale), Ltd.,** held its Christmas party at the Forest Hotel, Knowle, Birmingham, on 18th December. The gathering, which numbered 120 and included Mr. and Mrs. Westerman, took part in a dance and variety show which followed the dinner.

Obituary

Mr. E. W. Arnold.—The death occurred on 21st December at his home at Roughcot, 76, Hempstead Road, Watford, of Mr. Edward Willshin Arnold, B.A., A.M.I.E.E. He had been an associate member of the I.E.E. since 1906.

Mr. Stuart Evans, managing director of Evans and Wheeler, Ltd., electrical engineers, Market Street, Birkenhead, has died at the age of sixty-six.

Wills

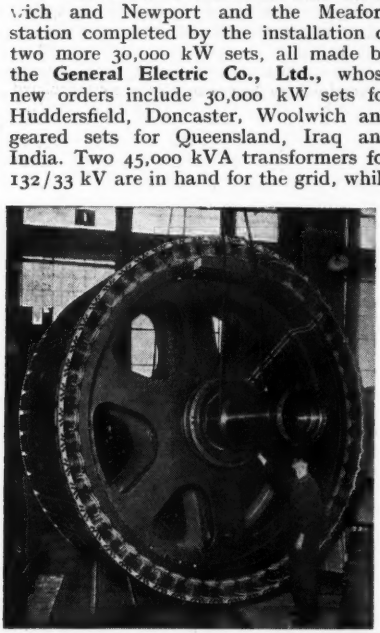
Mr. J. E. Kingsbury, M.I.E.E., a pioneer of the telephone industry, deputy chairman of Bakelite, Ltd., and director of the Western Electric Co., who died in November last, aged 93 years, left £109,339 gross (£108,830 net).

Mr. A. W. Bennis, M.I.Mech.E., chairman and managing director of Bennis Combustion, Ltd., who died in May last, aged 78 years, left £79,368 gross (£74,817 net).

Manufacturing Progress

ORDERS COMPLETED AND IN HAND IN 1948

DURING the past twelve months turbo-alternators of 30,000 kW have been commissioned at Woolwich and Newport and the Meaford station completed by the installation of two more 30,000 kW sets, all made by the **General Electric Co., Ltd.**, whose new orders include 30,000 kW sets for Huddersfield, Doncaster, Woolwich and geared sets for Queensland, Iraq and India. Two 45,000 kVA transformers for 132/33 kV are in hand for the grid, while



Magnet wheel of 9,000 s.h.p. propulsion motor —G.E.C.

ironclad reactors have been built for the Merseyside and North Wales area of the B.E.A., and oil-cooled capacitors for Austral Bronze Co. (Pty.), Ltd., Sydney, and for Yarraville.

A new range of metalclad switchgear is rated at 250 and 350 MVA at 6.6 and 11 kV for ratings up to and including 2,000 A, and of especial interest is an order for 84 heavy-duty units for the International Construction Co., of Johannesburg, for the Vanderbijl Park works of the South African Iron and Steel Industrial Corporation.

A comprehensive range of component parts for remote control boards has been standardized, and several schemes developed for the complete protection of the busbars of power stations all embody the patented load bias principle derived from the McColl method, which has been used by the G.E.C. for many years.

Mercury arc rectifiers are now made with additional anodes for exciting the fields of d.c. motors to enable a single grid-controlled rectifier to operate as a complete unit for variable speed driving, particularly rolling mills. Rectifiers have been supplied or are under construction for India, Australia, New Zealand, South Africa, Holland, Argentina, China and one built for home use is the 1,050 kW set for a rolling mill drive for the Lancashire Steel Corporation, Ltd., which has field anodes in the rectifier cylinder.

Paper-insulated cables subject to abnormal mechanical stress are sheathed with tellurium-lead by continuous extrusion. The fatigue resistance of this very dilute alloy is practically as high as that of Alloy E (BS. No. 1), which has a total percentage of alloying materials forty times as great. A non-ignitible filling compound for cable joints has been developed at the request of H.M. Chief Electrical Inspector of Mines, and has received the approval of his Department.

Pirelli-General continuous lead extrusion machines have recently been sold to the United States and Canada, and orders received from no fewer than seven different countries.

For the modernization of mines several winding engine equipments are in course of construction at Erith Works, and much equipment is on order for the Steel Company of Wales, including additional generating capacity and motors totalling 5,000 h.p. for blast furnaces, coke ovens and conveyors; also motors of many different sizes for the auxiliaries of other mills. The Poli-Khumri cotton mill in Afghanistan has been electrified throughout by the G.E.C., for which a.c. variable speed spinning motors with automatic regulators have been developed; considerable numbers are in course of construction for mills in Argentina, Turkey, Egypt, India and South Africa. Annunciators have been developed which,

should a thread break, stop the machinery and indicate the location of the fault.

Seventy-five trolley bus equipments on British United Traction chassis for Cardiff Corporation are being delivered, ninety-four for Belfast Corporation have been completed, and fifty-four are in hand for Hobart and Launceston, Tasmania.

For the order recently placed with the North British Locomotive Co., Ltd., from South Africa, for forty electric locomotives, all the electrical equipment (£1,000,000) is being supplied by the G.E.C. The first order ever to be placed for rolling stock with a British firm by a Portuguese railway has been received from the Sociedade Estoril for 1,500 V motor coaches and a locomotive, in the face of intense competition from Continental manufacturers. Also 156 600-V d.c. motors for new surface stock for the London Transport Executive, and the electrical equipment for seven battery locomotives for maintenance and constructional work.

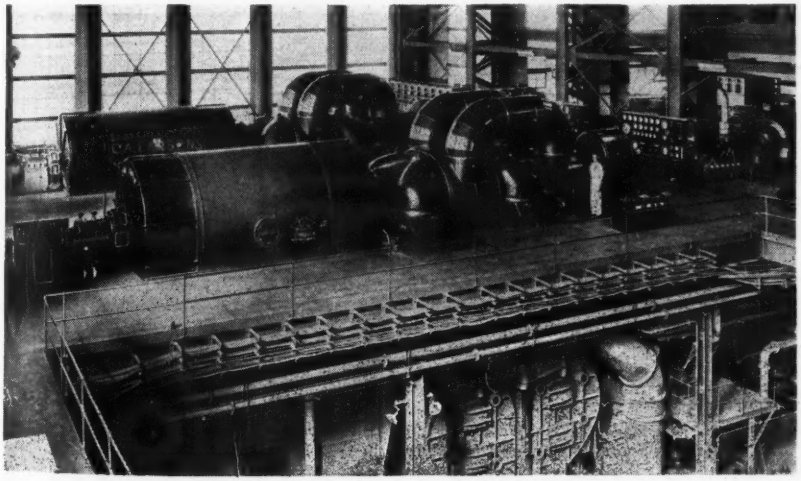
Complete equipment for a single-screw oil tanker for the Eagle Oil and Shipping Co., Ltd., has been installed. The propulsion motor is a 9,000 s.h.p. salient pole machine supplied from a 6,930 kW turbo-alternator. Orders for three similar equipments are in hand, and the G.E.C. has assisted in refitting the *Queen Mary, Queen Elizabeth, Mauretania, Queen of Bermuda, Orion, Orontes, Andes, Alcantara, Rangitiki, Strathmore, Strathaird* and *Stratheden*.

A third 60,000 kW hydrogen-cooled set for the North Tees power station, a fourth 50,000 kW set for Bunnerong, Sydney, Australia, and two 50,000 kW sets for Lake Macquarie station, New South Wales, Australia, all of the three-cylinder 3,000 r.p.m. type, are being made by **C. A. Parsons & Co., Ltd.**

A fourth 30,000 kW set has been ordered for Osborne "B," Adelaide, South Australia, and a machine of similar output for the New Tennyson power house of the Brisbane City Council, Australia.

The Electricity Supply Commission (South Africa) has ordered the sixth 20,000 kW set for Witbank and a 20,000 kW 3,600 r.p.m. machine will go to the Nova Scotia Light and Power Co., Ltd., Halifax, Canada, which already has one of the company's machines supplied in 1942. Turbo-alternators of from 4,000 to 15,000 kW are on order for India, South Africa, Canada, Iraq, and South America.

Among machines commissioned are two more 53,500 kW sets at Hams Hall



Two 40,000 kW turbo-alternators in the Congella station—Parsons

"B," Birmingham, where erection work on the sixth is in progress. In South Africa the second 40,000 kW set at Congella, the second 25,000 kW set at Bulimba, Brisbane, the second 30,000 kW set at Osborne "B," Adelaide, and the third 30,000 kW set at Newport "C," Melbourne, have all been completed. In Canada turbo-alternators of 4,000 kW and 7,500 kW have been completed and in South America a 7,500 kW set.

At the Consett Iron Co.'s works at Consett, England, two turbo-blowers each delivering 50,000 cu ft of air per minute at a gauge pressure of 25 lb/in.^{2} have been set to work. In South Africa a turbo-blower delivering 26,400 cu ft of air per minute at a gauge pressure equivalent to 29 lb/in.^{2} was completed for the African Metals Corporation, Ltd., Amcor power house, Natal.

Two gas turbine installations are being designed, one of 15,000 kW for Dunston (peak load) and the other of 10,000 kW for the National Gas Turbine Establishment at Pyestock.

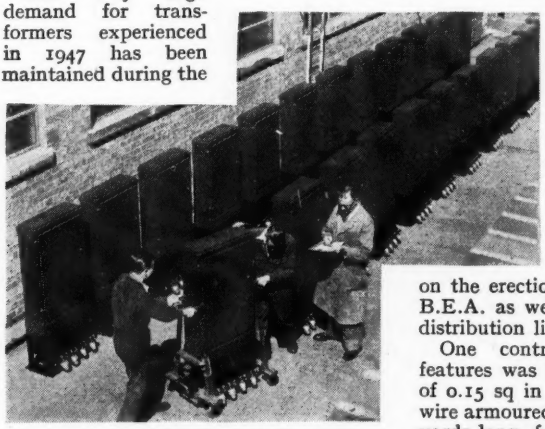
The very high demand for transformers experienced in 1947 has been maintained during the last twelve months. The new No. O Bay together with the new impregnating plant and extensions to transformer shops are completed. A large proportion of transformers of 10 to 75 MVA for up to 132 kV is for direct connection to turbo-alternators. South Africa has ordered fifty-three units totalling 57,500 kVA for use in steel works, three 2,500 kVA for a cement works, four 2,500 kVA 3-phase, 88/11 kV and thirteen 500 kVA distribution units. Among station auxiliaries are nineteen units totalling 59,500 kVA for Keadby and seventeen units totalling 84,775 kVA for a new station being built in the Persian Gulf.

The mechanization of the coal mines has continued the demand for transportable substations for use in this country, in Canada and in South Africa.

Air-cored, magnetically shielded current-limiting reactors on order include a further six single-phase 2,415 kVA 11 kV busbar reactors and three 66 kV reactors for North Tees.

Among the very large number of transformers commissioned last year were four 18 MVA units in a 33,000/11,850 V distribution centre in South West England. They have on-load regulating equipment on the h.v. side capable of varying the voltage from 85 to 115 per cent of normal in thirty 1 per cent steps, the fully automatic and parallel control equipment being mounted on a desk panel.

At the close of the year far better delivery times were quoted by **W. T. Henley's Telegraph Works Co., Ltd.,** for most products than seemed possible a year ago. Work has proceeded on contracts involving the manufacture and laving of cables up to 132 kV and on the erection of overhead lines for the B.E.A. as well as numerous low-voltage distribution lines.



Consignment of dwarf distribution pillars for shipment overseas—Henley's

One contract with some unusual features was for two continuous lengths of 0.15 sq in 33 kV screened s.l. double wire armoured and served cable, each 914 yards long, for the Electricity Board for Northern Ireland. Extensions to the Board's 33 kV mains from Ballylumford power station required a double-circuit submarine cable crossing of some 900 yards in Larne Lough, Co. Antrim.

The rising main system is being installed at Priory Court, Walthamstow, one of the largest post-war blocks of flats in Europe. It has also been installed in built-in chases by the Colston Electrical

Co., Ltd. (London and Bristol). The new cable factory at Newtown, Birtley, Co. Durham, has made considerable progress during the year, although manufacturing operations are not likely to commence for several months.

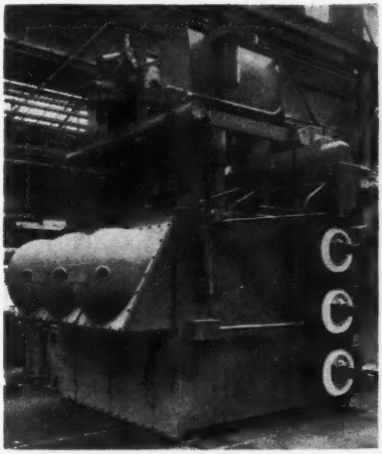
Individual export orders included a £300,000 order for telephone cables for the Turkish Government and an equally large one for similar types of cable for India. Considerable consignments have already been despatched and further shipments will be made in the near future. One contract for India comprises nearly 400 miles of overhead lines, mainly for 66 and 33 kV, on spun reinforced concrete poles. This contract is being carried out on behalf of the Central Provinces Government in the Nagpur district.

It is significant that orders for one size of horizontal-draw-out oil break switchgear pioneered by **A. Reyrolle & Co., Ltd.**, increased by as much as 80 per cent in 1948 over those for the previous year. Increased manufacturing facilities had to be provided and in February a new workshop of about 50,000 sq ft was completed.

For small-oil-volume and airblast switchgear for from 33 to 132 kV and for up to 2,500 MVA the demand was greater than ever before, particularly for the small-oil-volume type. Orders for medium-voltage switch and fuse gear were also well above the average.

The forward load planning of the National Coal Board necessitated extending the delivery periods of many items. New problems in the sequence-interlocking and control of conveyor-belts were further complicated by the need for protection against belt-slip and broken belts. The use of coal-ploughs in some pits necessitated heavy chain-conveyors, driven by two motors like some of the ploughs themselves, and further schemes had to be developed not only to ensure that both motors would start simultaneously but also to prevent the reversal of one without the other.

The export business, particularly for welding sets, has been somewhat adversely affected by the difficulty of obtaining import licences and transfer of currency by importers. Wider use is being made of the company's variable-speed commutator motors and a special form for ring-spinning frames was developed. In spite of a generally small demand for printing press drives because of paper restrictions, an order was received for the only press in Great Britain with the motors mounted compactly on the press substructure. True-sine-wave alternators for the accurate calibration and testing of meters are in hand for the National Physical Laboratory and for a similar institution in South Africa.



One unit of vertically isolated single break circuit breaker, the conditioned-air-insulated back position having ring busbars—Reyrolle

Australian News

From Our Own Correspondent

THE Governments of New South Wales, Victoria and South Australia are to be asked to approve plans recommended by an inter-State conference which will increase the cost of the Murray River water storage scheme from £12,000,000 to £14,000,000. By raising the spillway level by 20ft, the capacity of the Hume River reservoir will be increased to 2,000,000 acre-feet.

The Premier of Western Australia (Mr. McLarty) states that the value of work done on the South Fremantle power station and of the equipment landed already exceeds £1,100,000. Total cost of the first section of the station and of the change in frequency from 40 cycles to 50 cycles was originally estimated at £3,400,000, but this figure will now be exceeded owing to the higher cost of wages and materials.

Equipressure Cycle

APPLICATION TO THE COMBUSTION TURBINE

By ERNEST MERCIER*

THE main features of the various applications of the combustion turbine, frequently called the gas turbine, lie first in the nature of the air compressors used. We have studied compressors of every type, but most interest in this connection lies in those employing free pistons. We use the term in a much wider sense than usual, however. Actually we have planned and studied free-piston compressors for a multiplicity of prime movers, which may be either two- or four-stroke internal-combustion or steam or compressed-gas. Finally, side by side with linear free oscillating

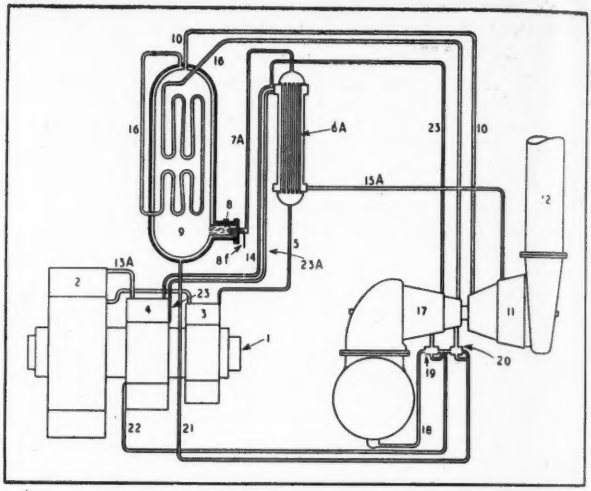


Fig. 1.—Circuit diagram when compressors are driven by internal-combustion engines

1, Oscillator; 2, low-pressure air compressor; 3, intermediate- and high-pressure air compressor; 4, prime movers (internal-combustion engine in Fig. 1 and gas turbine in Fig. 2); 5, high-pressure air; 6A, heat exchanger; 7A, high-pressure heated air; 8, burner, and 8f, fuel supply; 9, equipressure boiler; 10, boiler high-pressure exhaust gas; 11, gas turbine; 12, gas-turbine exhaust; 13A, supercharged compressed-air piping; 14, exhaust from prime movers (internal-combustion engine in Fig. 1 and gas turbine in Fig. 2); 15A, exhaust gases from exchanger; 16, superheated steam 17, steam turbine; 18, steam-turbine condensate; 19, bleeder; 20, bleeder; 21, boiler feed-water; 22, water heated at 120 deg. C. for cooling prime-mover water jacket; 23A, annular piping for superheating 120 deg. C. steam; 24B, intermediate-pressure compressed air; 25B, burner for exhaust gas heater; 26B, heat recuperation.

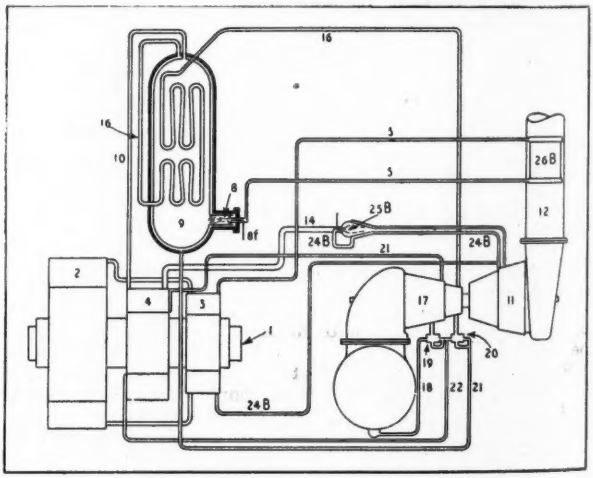


Fig. 2.—Circuit diagram when compressors are driven by gas turbine prime mover using gases from boiler

* *Past-President, Conférence Internationale des Grands Reseaux Electriques (C.I.G.R.E.)*

compressors we have built up apparatus oscillating round an axis which we have termed "free oscillators." These are simple and reliable and allow for an exceptional concentration of energy. In the following we shall usually assume that the compressors are free oscillators.

Our studies made considerable progress when we planned the "equipressure boiler." We thus term a boiler in which the air for combustion and subsequently the gases from combustion reach substantially the same pressure as the superheated steam produced.

The main features of such a boiler are briefly as follows: Greatly reduced volume; elimination of chimney loss and of steam pipes; possibility of substantial increase in superheat; considerable facility for arranging reheating; and considerable saving in installation and maintenance costs. The weight is only 3 or 4 per cent of that of a standard boiler. The reason will be apparent from the following example. At a working pressure of 1,400lb/sq in (100kg/sq cm) the active surface of the equipressure boiler is only 0.05 that of a standard boiler, since the heat transmission coefficient is proportional to P 0.75 (where P = pressure). Moreover the metal thickness is less than 0.25 of the ordinary figure as a consequence of the equality of the pressure inside and outside the boiler.

With the same steam turbine, the utilization of the equipressure will improve the ultimate efficiency. The best steam installation now existing gives an overall efficiency of approximately 35 per cent for the higher calorific power of the fuel; with the same turbine and employing the equipressure system this figure is increased to approximately 40 per cent.

Finally it must be stressed that an equipressure boiler is much smaller and more easily built as its operating pressure is higher. Our most recent researches have enabled us to shape the equipressure boiler in a very simple manner which can easily be adapted to pulverized coal.

An equipressure boiler is a double generator producing steam and hot compressed gases at the same pressure simultaneously. The steam can be used to feed a steam turbine. The hot gases on the other hand can be used in many ways, e.g., to feed a gas turbine. The equipressure cycle is thus the result of the combination of two cycles, a steam cycle and a gas cycle.

There are as many ways of effecting the equipressure cycle as there are

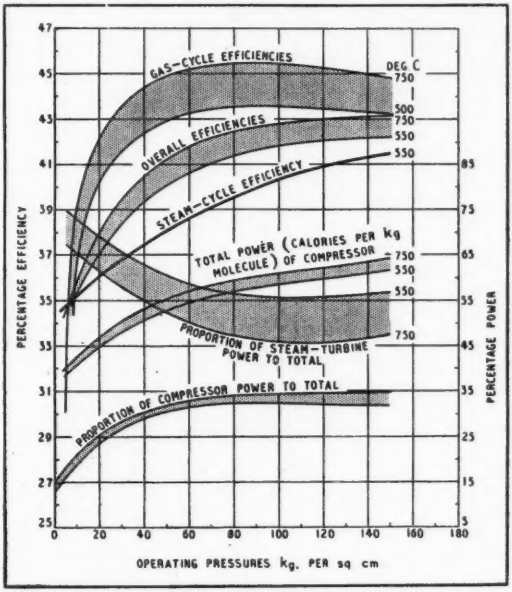


Fig. 3.—Efficiencies and power proportions of Fig. 1, without jacket-heat recovery

different means of driving air compressors. We have classified them in four categories, in which the compressors are driven (a) by internal-combustion prime movers, (b) by prime movers operated by the gases emitted by the boiler, (c) by prime movers operated by the steam from the boiler and (d) directly by the turbine or turbines, the compressors in this case being of the rotary type. Furthermore there is a considerable variety of combinations of two or more categories. Finally in each case a relatively variable importance can be given to the boiler,

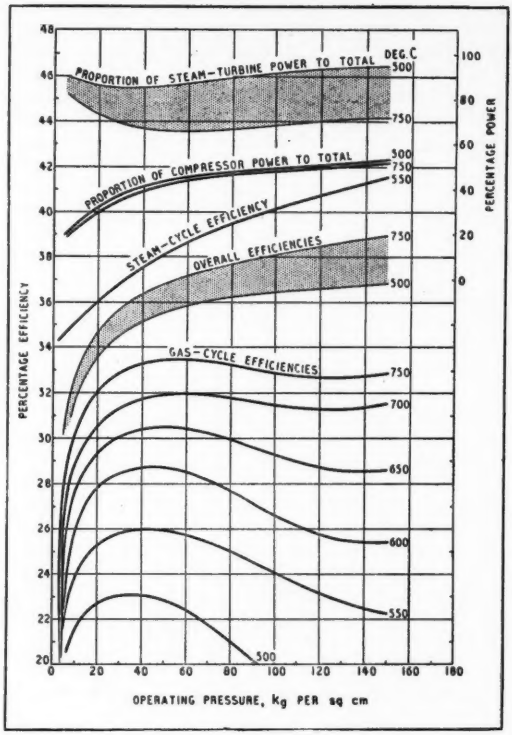


Fig. 4.—Efficiencies and power proportions of Fig. 2; simple case without waste heat recovery

which can even be eliminated. As special cases, one thus meets with all the familiar processes for effecting the combustion-turbine cycle.

One of the main features of these combinations is that they lend themselves to a large number of heat recuperations such as the following: Reheating the compressed air in an exchanger by the exhaust gases from the supercharged combustion prime movers; using the exhaust gases leaving the exchanger in the gas turbine to the corresponding low stages; using water under pressure, e.g., 70 lb/sq in and 300 deg F (5 kg/sq cm and 150 deg C), bled from the turbine to cool the jackets of the combustion prime movers by partial vaporizing; cooling the jackets by compressed air; and reheating the compressed air by steam bled from the steam turbine.

Figs. 1 and 2 illustrate diagrammatically the apparatus mentioned in categories (a) and (b) respectively, and Figs. 3 and 4 give the corresponding groups of curves of efficiency and operation. Category (c) is of little importance; category (d) has substantially reduced efficiency.

These show that, as compared with the familiar cycles of the combustion turbine and the finest steam installations, the equipressure cycle has a very definitely increased efficiency. According to the equipment selected one can operate either by using pulverized coal or inferior-quality fuel (cycle b simple) or by using coal or fuel with up to 100 per cent of gas-oil. Efficiency usually increases with the gas-oil proportion, i.e., with the importance given to the combustion prime movers. The use of the same factors in appreciably different combinations will enable the scope of the method to be extended considerably.

As regards practical applications, an experimental 1,100 h.p. plant at the Vitry power station with a boiler rated at 570lb/sq in (40kg/sq cm) has undergone a large variety of tests during the last eighteen months. A plant is under construction with a total power of 15,000kW which it is hoped to complete at the end of this year. This is designed to allow a complete check of all the conclusions summarized above, the original features of which are protected by patents. We believe that 1949 will see large-scale applications of the system to industry, power stations, shipping and locomotives.

Glasgow Railway Electrification

The Glasgow Corporation is to meet representatives of British Railways and the Ministry of Transport on the question of the electrification of local railway services.

COMMERCE and INDUSTRY

Alternator for Gas Turbine: Croydon Meter Panel Layout

THE Brush Electrical Engineering Co., Ltd., has received from John Brown & Co., Clydebank, an order for an alternator to be driven by the first closed cycle gas turbine to be installed in the United Kingdom. This set is to go into operation in the Dundee power station under the auspices of the North of Scotland Hydro-Electric Board. The alternator will have an output of 12,500 kW at 0.85 power factor, 11,000 V, 50 c/s, three-phase at 3,000 r.p.m., with exciter and closed circuit air cooler.

Research in Industry

A series of articles originally published during the last two years in the *Board of Trade Journal* have now been reprinted in one volume of 84 pages and issued for the D.S.I.R by the Stationery Office at 1s 6d. Seventeen industries are dealt with, including electronics by Dr. H. A. Thomas, the electrical industry and consumer goods by Dr. S. Whitehead (the E.R.A. director) and radar by Sir Robert Watson-Watt. The emphasis in each case is on the value of research for the future, immediate and more distant, while the necessity of following up the results of research at once is stressed in a foreword by Sir Edward Appleton. Two appendices list D.S.I.R. departments and industrial research associations.

Token Imports

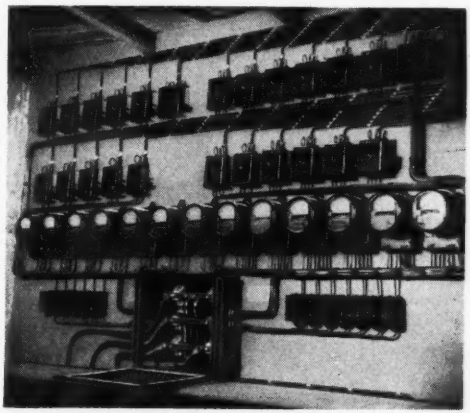
The Board of Trade announces in Notice to Importers No. 306 that the Token Import Scheme is to be continued in 1949 on the same basis as in 1948. The Token Import annual quota will remain 20 per cent by value of each individual manufacturer's average trade in 1936-38 with the United Kingdom in the commodity in question. The countries participating in the scheme will be Australia, Belgium and Luxemburg, Canada, Denmark, Finland, France, Holland, India, Italy, Norway, Pakistan, Sweden, Switzerland and U.S.A.

Fire-fighting Demonstration

A demonstration of an improved type of the "Antifyre Pistole" fire extinguisher was given last week at the Deptford power station by Antifyre, Ltd., Shaftesbury Road, Acton. Blazing petrol, oil, tar, acetone, etc., and the arc of an electric welding set were rapidly put out, generally with only one "shot." When the "Pistole" is fired the charge is projected in the form of a cone-shaped expanding cloud of powder travelling forward for a distance of about 25ft and spreading to a width of 3ft. The flames are normally extinguished within one second. If more than one "shot" is required, the "Pistole" can be reloaded in two seconds. The powder, which is claimed to be completely harmless to persons, machinery and fabrics, will deal with any kind of fire and gives off no fumes. The apparatus has been used successfully on fires on high-voltage circuits.

Metering Equipment

An excellent example of neatness and utility in installation work is illustrated by the main metering and distributing panels which are fitted as standard in the buildings now being converted by the County Borough of Croydon for use as "half-way" houses under the Ministry of Health's rehousing scheme.



One of the panels at Croydon

The installations are carried out in tough rubber-sheathed cable and provide for one 15 A socket and one lighting point in each room. Kitchens, corridors, laundries and other rooms in communal use are wired separately, fitted with Edison screw lamp-

holders and metered on a landlord's meter. For convenience of maintenance and meter reading, all switch fuses, meters and service cut-outs are arranged on one panel fed from a three-wire supply through a triple-pole bus-bar chamber. The work is being carried out by the Building Construction and Maintenance Department of the borough valuer, Mr. T. G. Daniels.

Area Sales Lecture

One of a new series of sales lecture meetings, organized by the South-Eastern and Southern E.D.A. Area Committee, was held on 20th December at the Polytechnic, Regent Street, W.1, when Mr. C. F Wells, chief commercial officer, South-Eastern Electricity Board and chairman of the Area Committee, presided over a large audience of representatives of the sales staffs of the South-Eastern and Southern Electricity Boards. The subject was that of "Electrode and Immersion Heater Boilers," the lecture being given by Mr. S. A. Williams of Bastian and Allen, Ltd., who covered a large amount of ground which included their application, installation and maintenance problems, capital and running costs, special attention being given to "off peak" loads.

Mr. S. A. Williams lecturing at the South-Eastern & Southern E.D.A. Area Sales lecture meeting. On the left is Mr. R. D. Reynolds (Area Officer) and in the centre, Mr. C. F. Wells (chief commercial officer, S. E. Electricity Board, and chairman of the Area Committee)

Leicester Industries Exhibition

A Leicester and Leicestershire Industries Exhibition and Trade Fair, organized under the auspices of the Leicester and County Chamber of Commerce and the patronage of the Leicester Corporation and the Leicestershire County Council, will be held at the Granby Halls, Leicester, from 19th to 28th May, 1949. Exhibits covering the manifold activities of the City and County will be shown, including electrical displays. Applications for space should be made to the Exhibition Director, 8, Salisbury Road, Leicester.

Television in Council Houses

The Westminster City Council has accepted an offer of a relay company to install and maintain a radio and television service in houses on the Council's Pimlico and Cambridge Street estates. It is proposed that the tenants shall be given the choice of four programmes. The weekly cost would be about 4s 6d a week initially, falling to 3s 6d after a year.

Electrical Housecraft Advisors

At the recent E.A.W. National Training and Diploma Committee it was agreed that in future the title "Electrical Housecraft Advisor" should be applied only to those holding the E.A.W. diploma in the general test—cookery demonstration, laundry demonstration and salesmanship. All such diplomas will be endorsed accordingly, and the special diploma badge will only be granted on this basis.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association announces the following figures for its contract price adjustment formulæ:—The rate of pay for adult male labour at 11th December was 115s. The Board of Trade index figure for intermediate products (11th December) was 251-2—the figure for November.

Injunction Refused

Under this heading in our issue of 19th November (p. 778) we reported an action brought by Electric Transmission Ltd., against Mr. Kurt Dannenberg. We are now informed by E.M.P. Electric, Ltd., a company formed by Mr. Dannenberg and others, that it was not the case that the plaintiffs pleaded that E.M.P. and the defendant were using the plaintiffs' patents in breach of an agreement. In fact, the plaintiffs claimed the rights to an invention made after the defendant had left the plaintiffs' employ, and the action was heard both as regards this and other facts relating to the agreement between the parties. As we reported, Mr. Justice Romer dismissed the claim with costs.

Stanton Ironworks Training Centre

In June, 1947, the Stanton Ironworks Co., Ltd., opened a training centre at its principal works at Stanton to enable these training facilities to come within the reach of every boy at the company's works and quarries, the company has now acquired a

large house which has been equipped as a hostel where the boys may live under the care of an experienced warden and his wife while undergoing training. The hostel will be opened on 3rd January next. A well-illustrated brochure has been issued by the company describing the training centre.

South Eastern Board Fined

At Ramsgate on 20th December the South Eastern Electricity Board was summoned by an Inspector of Factories following an accident to one of its employees. It was stated that a youth under 21 years of age was engaged in work which involved technical knowledge. A tape measure which he was using fell across some apparatus, there was a flash and the youth's face and wrists were burned. The magistrates inflicted a fine of £25.

Changes of Name

The Ryness Electrical Co., Ltd., has changed its name to Ryness, Ltd. Domestic Facilities, Ltd., has become Electrical Refrigeration and Radio Engineers (Epping), Ltd.

The name of Cuttriss Radio and Electrical, Ltd., Birmingham, has been changed to Cuttriss, Ltd.

From 1st January the name of John Ismay & Sons, Ltd., will be changed to Ismay Lamps, Ltd.

Electricity Consultative Councils

The Ministry of Fuel and Power has announced the appointment of further Electricity Consultative Councils. For the South East Scotland Area the chairman is Bailie J. M. Airlie (Edinburgh) and deputy chairman, Mr. M. I. H. Mackenzie-Inglis (Milton Bridge, Midlothian).

Alderman W. J. Bennett (Grays, Essex) is chairman and Alderman S. C. Grimwade, J.P. (Ipswich) deputy chairman of the Consultative Council for the Eastern Area.

Hairdryer Motor

Referring to their advertisement in the *Electrical Review* of 24th December, Charles Alexander & Co., Ltd., state that their "Magicflow" hair dryer is now fitted with an a.c./d.c. universal motor.

Catalogues and Lists

Neo Electrical Industries, Ltd., 87/89, Corporation Street, Manchester, 4.—A leaflet describing the new "Neolec Maintest" tester.

Miller-Hepworth, Ltd., Lee Street, Oldham.—Literature relating to "Perspex" fluorescent lighting fittings and "Natralite" fluorescent tubes.

C. A. Parsons & Co., Ltd., Heaton Works, Newcastle-upon-Tyne, 6. — Illustrated brochure describing the construction of turbo-type alternators with details of exciters, brush gear and cooling systems.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1.—Two priced leaflets illustrating the new "Giant" table cooker and the white 902 and 903 (with automatic cut-out) clothes wash boilers.

Wilkins & Wright, Ltd., Unity Works, Holyhead Road, Birmingham, 21.—Catalogue of electrical and general stamped brassware, chains, etc., and priced folder on lighting fittings.

Sturtevant Engineering Co., Ltd., Southern House, Cannon Street, London, E.C.4.—Brochure on the pneumatic collection of wood refuse.

The Arora Company, Rosebery Street, Loughborough.—Leaflets C482-3 giving the latest information relating to the company's canteen hot cupboards, toaster grillers, scone-cooking plates and warming plates.

Trade Announcements

The **Metropolitan-Vickers Electrical Co., Ltd.,** has appointed J. Van Aalst & Co., Colonial Buildings, 16-17, Fownes Street, Dublin, as its agents in Eire for the sale of "Metrovick" and "Cosmos" lamps and lighting equipment.

G. B. Carnegie & Co., Ltd., have removed to 54, Gallowgate, Newcastle-on-Tyne, 1 (Telephone: Newcastle 21636).

Trade Marks

RECENT applications for the registration of trade marks include the following, objections against which may be entered within a month from 22nd December.

QUALRAD (design). No. 653,003, Class 9. Current transformers, coils, chokes, voltage dropping resistances, interference suppressors, wire-wound volume controls, aerials, loudspeakers, accumulators, battery eliminators, tuning units, sound amplifying apparatus and battery charging apparatus, all being electrical apparatus.—A. E. Powell, Ltd., 118, Sheen Road, Richmond, Surrey.

ELECTROBOT. No. 661,697, Class 7. Electrically operated fuel supply equipment for internal combustion engines, and parts included in Class 7. No. 661,698, Class 9. Electrical apparatus and instruments. HYDROBOT.—No. 661,700, Class 9. Indicating, measuring, recording and control instruments and apparatus.—G. S. Kammer, 48, Albemarle Street, Piccadilly, W.1.

CASQUIL. No. 666,858, Class 9. Electrical control apparatus.—Igranic Electric Co., Ltd., Elstow Road, Bedford.

Oil Engine Costs

To enable comparisons to be readily made, the form of the report presented annually by the Diesel Engine Users' Association has not been changed. The returns for 1946-47 show that 24 out of 36 stations were below the standard curve in respect of fuel oil consumption, which was thus 6.75 per cent better than the standard. The average for all stations was 0.614 lb/kWh generated at a running plant load factor of 66 per cent. A considerable number of stations used less lubricating oil than the accepted standard figure, the average b.h.p.h. run/gal being substantially the same as in the previous year. The total number of stations reported upon decreased by nine to 49; a total of 108 engines at home of 34,204 kW generated 25.6 million kWh and 58 engines overseas of 34,242 kW generated 86.8 million kWh.

I.E.E. Armorial Bearings

Members of the Institution of Electrical Engineers, when they receive their January *Journal* will see that the familiar Faraday head backed by a compass dial has been replaced by a much more elaborate device. It is the new coat of arms recently

Armorial bearings of the I.E.E.

approved by the College of Arms, and it is depicted herewith. In its production a special Committee, assisted by two heraldry experts, Messrs. L. F. Salzmann and S. C. Kaines-Smith, aimed at symbolizing the rights and duties of the Institution rather than the principles of electrical science. The upper part of the shield bears a pattern of blue and gold waves "representing one of the fundamental concepts of electrical engineering," on which is an open book displaying the words *Disce Doce* ("Learn and Teach"), an allusion to the exchange of knowledge and the interest in education which are two of the Institution's principal attributes. In the lower part of the shield, on a blue background, is a winged thunderbolt surrounded by a golden ring decorated with fleurs-de-lis, symbolizing the power of electricity under control. The royal leopard in the crest signifies the status of the Institute as a body incorporated by Royal Charter; it supports in its right fore-paw the caduceus of Mercury (symbol of communication). The winged-horse supporters were chosen to represent the speed and docility which are characteristics of electricity in the service of man. The St. Michael's Crosses on their breasts are allusive to Michael Faraday as a tribute to the great man's work, in which the Institution takes great pride.

New B.B.C. Station

There has been a radio broadcasting station at Brighton since 1941, when 100W emergency transmitters were installed in many of the principal towns in the U.K. The B.B.C. has now completed a new station of 1 kW on a 3.5-acre site at Kingston-by-Sea, 300 yards from the shore, midway between Brighton and Worthing. Electricity is purchased from the public supply mains. A self-supporting steel tower, 150ft high, is itself the transmitting aerial, so that it is advisable to use vertical receiving aerials. An aircraft warning lantern at the top of the tower is illuminated automatically whenever visibility is poor. The earthing system is a buried network of copper wire radiating from the building over practically the whole site.

Utilities War Damage

Last week the text was published of the War Damage (Public Utility Undertakings, etc.) Bill (Stationery Office, 1s. 3d.). This provides for payments and contributions in respect of war damage to public utility undertakings which were not covered by the War Damage Act, 1943.

Clause 2 of the Bill sets out the aggregate of gross amounts of payments in respect of undertakings; for the electricity group the amount is £9,663,194. It is provided that the aggregate of the gross amount of contributions in the case of this group is 27½ per cent of the gross amount of payments. Where there has been a change in the identity of the bodies carrying on the public utility undertaking, the Treasury is to determine, after consultations with the bodies concerned, which body is to have the payment or pay the contribution.

Overseas Electrical Trade

STILL HIGHER EXPORTS IN NOVEMBER

ONCE again all previous electrical export records were broken in November when the total value was £9,657,000, slightly greater than the previous highest figure, £9,591,000 in October. Reference to Table I shows that the cable classes made a substantial contribution to the increase as compared with the corresponding month of last year; the total value of cable exports was £2,237,350, against £1,266,591 in November, 1947. For non-submarine telegraph and telephone cables and cables with insulation other than rubber South Africa was the principal customer. India and Pakistan were also large buyers of these and also of rubber-insulated types.

TABLE I.—ELECTRICAL EXPORTS AND IMPORTS

Class	Exports			Imports		
	November, 1948	November, 1947	Monthly Av., 1938	November, 1948	November, 1947	Monthly Av., 1938
	£	£	£	£	£	£
Telegraph and telephone wires and cables (submarine)	45,720	6,981	17,289			
Ditto, not submarine	738,0 4	383,004	71,803			
Wires and cables, rubber insulated	489,210	500,704	117,533			
Ditto, cotton, silk or artificial silk insulated	64,526	48,411	*	18,001	11,947	31,246
Ditto, enamel, glass or asbestos insulated	37,093	16,673	*			
Ditto, paper insulated	772,188	104,183	103,457			
Ditto, other	88,519	116,635	49,799			
Commercial radio apparatus	236,580	152,921	28,296	28,517	11,475	58,018
Domestic radio apparatus	269,187	318,665	36,755	59,3 7	13,642	
Telegraph, telephone and signalling apparatus	1,147,644	759,029	242,716	3,917	1,773	9,243
Other radio, etc., apparatus	287.202	322,703	57,848			
Radio valves	142,295	155,194	41,272	10,759	22,653	10,803
Electric carbons, furnace	*	*	*	42,734	29,077	4,054
Ditto, other	*	*	*	3,181	17,482	2,301
Electric lamps, not exceeding 24 V	19,577	16,083				
Discharge lamps	42,228	28,606	49,440	8,744	3,761	10,265
Other lamps	78,038	66,121				
Other lighting apparatus	441,744	289,110	48,565	3,512	9,102	38,662
Primary batteries	97,278	69,806	13,572	*	*	*
Accumulators for motor vehicles	138,643	126,725	16,418	*	*	*
Ditto, traction	16,200					
Ditto, radio	3,915	63,995		*	*	*
Other portable accumulators	66,130		12,456	*	*	*
All other accumulators	27,286	9,779	19,773	*	*	*
Parts and accessories	47,881	56,416	*	*	*	*
Cooking apparatus and elements	146,439	115,353	16,600	*	*	*
Heating apparatus and elements	57,802	83,744	14,064	*	*	*
Other parts and accessories	30,057	33,407	*	*	*	*
Commercial electrical instruments	100,880	86,884	15,878			
House service meters	188,048	129,703	15,971	14,093	14,078	32,057
Other electrical instruments	78,079	80,913	9,612			
Electro-medical apparatus (not X-ray)	38,818	22,372	3,038	*	*	*
X-ray apparatus, tubes and parts	72,757	60,776	4,881	29,874	36,516	9,734
Insulating cloth and tape	88,434	38,921	7,038	*	*	*
Other insulating materials	122,419	70,181	12,305	*	*	*
Unclassified goods and apparatus	449,515	270,708	108,085	28,409	35,263	56,529
Generators, up to 200 kW	372,650	155,545	38,071	*	*	*
Ditto, over 200 kW	135,212	351,496	119,079	*	*	*
Ditto, parts	85,302	248,707	*	*	*	*
Motors, railway and tramway	7,886	20,550	15,977			
Ditto, other, up to ¼ h.p.	143,749	46,876	9,001			
Ditto, from ¼ to 1 h.p.	72,449	33,972	2,470	29,038	14,240	26,033
Ditto, from 1 to 250 h.p.	538,420	297,389	96,637			
Ditto, over 250 h.p.	40,099	128,076	20,960			
Ditto, parts	46,474	53,389	*			
Converting machinery	8,688	11,471	101,304			
Transformers, including coils	359,886	274,230				
Rectifiers for power house use	35,519	11,531	3,463			
Motor starting and controlling gear	150,341	113,497	50,866	17,805	110,471	14,455
Switchgear and switchboards (not telegraph or telephone)	710,519	396,640	184,533			
Other electrical machinery	31,944	30,911	15,497			
Vacuum cleaners and parts	144,510	171,140	26,662	10,677	10,203	24,627
Other electrically operated portable appliances	102,965	21,132	10,394			
Total	9,657,039	7,066,357	1,829,198	308,578	341,683	328,117

* Not separately distinguished.

Although there was a decline in exports of domestic radio receivers, commercial radio equipment exports advanced. There was a large increase in shipments of telegraph and telephone apparatus for which South Africa (£224,220) and Australia (£265,201) were mainly responsible.

Cooking and heating apparatus exports remained at about the 1947 level with Australia heading the list with a share increased from £28,412 to £67,219. Electrical instruments went largely to India and Pakistan (£118,474, against £48,852).

Taking the electrical goods and apparatus section as a whole (Table II) South Africa was easily the principal buyer with a share valued at £993,859, against £607,893. Next came India and Pakistan (£810,072, against £282,579, a remarkable increase), and Australia (£767,870, against £278,409).

As regards electrical machinery and heavier equipment, there was a rise from £2,179,289 to £2,739,138, largely because of higher motor exports, particularly in the fractional h.p. and 1-250 h.p. classes. There was a heavy fall in exports of the larger machines—from £128,076 to £40,099. Heading the list of motor buyers were Australia (£143,521 against £25,079), India, Pakistan, etc. (£133,887 against £70,066) and South Africa (£130,668 against £69,084).

Generator exports were lower owing to a cut in shipments of the larger machines. In this section Russia led the way with purchases valued at £187,125, against £32,787 in November, 1947.

Exports of other "machinery" classes, including switch- and control-gear, were were about 50 per cent higher than in the corresponding month of 1947, largely on account of greater shipments to India and Pakistan (£276,576 against £122,457), South Africa (£238,499 against £106,927) and Russia (£139,186 against £84,423).

Vacuum cleaner exports were down because of smaller purchases by New Zealand and Australia.

Table II.—Distribution of Exports of Electrical Goods and Apparatus.

Destination	Nov., 1948	Nov., 1947	Monthly Av., 1938
	£	£	£
To Eire	267,556	289,084	37,726
,, Channel Islands ...	50,770	59,101	12,177
,, Malta and Gozo ...	51,361	13,403	5,873
,, Cyprus	17,452	11,876	1,373
,, Palestine	5,423	185,438	8,426
,, British West Africa	76,189	71,242	12,889
,, Union of South Africa	993,859	607,893	162,584
,, Southern Rhodesia	99,287	78,140	9,632
,, British East Africa	133,552	88,309	7,893
,, India, Pakistan, etc.	810,072	282,579	123,789
,, British Malaya ...	170,909	167,847	32,792
,, Ceylon	93,835	47,995	15,048
,, Hong Kong ...	89,717	55,673	12,939
,, Australia	767,870	278,409	197,366
,, New Zealand ...	246,078	254,181	96,225
,, Canada	50,353	26,749	12,547
,, British West Indies	101,589	69,757	12,954
,, Anglo-Egyptian Sudan	17,652	3,910	2,989
,, Other British Countries	142,092	41,643	11,0 0
,, Soviet Union ...	84,425	27,454	36,781
,, Finland	40,567	62,671	5,969
,, Sweden	220,612	191,315	14,948
,, Norway	128,063	193,570	12,881
,, Iceland	29,975	5,890	2,796
,, Denmark	93,360	69,561	18,907
,, Poland	47,105	105,362	9,702
,, Netherlands ...	186,448	148,014	22,010
,, Belgium	109,061	89,773	11,208
,, France	26,072	71,711	16,082
,, Switzerland ...	33,443	26,285	3,768
,, Portugal	84,172	57,283	6,512
,, Spain	53,512	29,614	3,813
,, Czechoslovakia ...	16,876	26,398	7,205
,, Yugoslavia ...	5,092	1,720	1,475
,, Greece	26,849	66,074	4,926
,, Turkey	46,085	96,614	7,684
,, Dutch East Indies	31,128	20,145	2,692
,, Dutch West Indies	5,094	13,427	830
,, Portuguese East Africa	46,159	13,775	6,942
,, Lebanon	29,433	12,829	—
,, Egypt	222,631	53,410	13,176
,, Iraq	74,163	96,970	5,530
,, Iran	139,551	53,197	16,345
,, Burma	21,361	60,799	5,337
,, China	25,570	71,158	4,116
,, United States of America ...	16,892	13,369	5,839
,, Mexico	37,092	11,355	1,466
,, Colombia	10,226	21,818	845
,, Venezuela	76,034	53,785	2,936
,, Chile	18,536	11,266	6,635
,, Brazil	69,509	65,011	11,164
,, Uruguay	8,788	22,690	1,790
,, Argentine Republic	180,998	92,263	45,452
,, Other Foreign Countries	237,928	104,991	40,270
Total	6,670,426	4,694,796	1,134,284

Progress Towards Export "Targets"

The *Board of Trade Journal* for 25th December contains tables showing the progress made by various industries towards the export "targets" set for them. It is indicated that exports of electrical goods and apparatus in November were valued at £6.67 million; the monthly rate to be reached by the end of the year is £7.07 million. Wires and cables more than achieved their quota; the November figure was £2.24 million, against a target of £1.95 million. Other classes did not reach their end-1948 targets, although they were generally not far off. The figures were as follows: radio apparatus, £0.94 million (target, £1.20 million); telephone and telegraph apparatus, £1.15 million (£1.25 million); lighting apparatus, £0.58 million (£0.82 million); other electrical goods, £1.76 million (£1.85 million).

Electrical machinery exports were well ahead of the expected figure; November exports amounted to £2.74 million, while the end-1948 target was £2.40 million.

FINANCIAL SECTION

Company News
Stock Exchange Activities

Reports and Dividends

Crompton Parkinson, Ltd.—The report and accounts now issued confirm the preliminary figures given in our issue of 17th December. The net profit for the year is £522,065, as compared with £450,895 for 1946-47, to which is added £916,297 brought in. There is a balance available of £2,032,180. As already announced the dividends are unchanged. The balance carried forward is £1,656,506.

The consolidated profit and loss account shows a trading profit of £1,687,968 (against £1,332,118), to which is added other income, making £1,706,102, and after deducting depreciation, taxation, expenses in connection with increase of capital etc., and transferring £173,123 to specific reserves, there is an aggregate net profit of £567,799 (against £473,198).

In his statement issued with the report and accounts, Mr. A. Parkinson (chairman) says that the directors intend to change the dates of dividends on the preference stocks from June and December to March and September of each year.

The task of consolidating and expanding their overseas organization has continued during the year under review. The growing development of secondary industries in many overseas countries and the commencement of such development in others, cannot fail, in due course, to reduce or even eliminate such countries as markets for some of the company's products. Such development does, however, lead to the enlargement of the markets in those countries for their heavier and more technically complex products.

Further progress has been made in Australia, India and New Zealand, and the company is entering the field of local manufacture in South Africa. During the past year arrangements have been concluded for the disposal of part of their interest in the Bombay factory to an Indian industrialist. They are already associated with their new manufacturing partner in the operation of a joint selling company in India, and are now engaged on the formation of a similar joint company in Pakistan.

With regard to the future, the main products of their company may be classified as capital goods for which, as their order book shows, there is still an unsatisfied demand. There is, however, a slackening of demand for some of their products classified as consumer goods. The new factory at Doncaster is now in production in all sections.

Autolec, Ltd.—At the first annual general meeting held in Johannesburg on 20th December, Mr. C. I. Whitehead, chairman, announced that the company had entered into a contract with the Willard Battery Co., Ltd., and a subsidiary company to conduct these operations had been formed. A site for a factory had been purchased in Port Elizabeth. Sales figures for the five months ended 30th November showed an increase of approximately 22½ per cent over the figure for the corresponding period of last year.

Joseph Lucas, Ltd.—Speaking at the annual general meeting on 20th December Sir Peter Bennett (chairman) said that the Lucas and C.A.V. factories were now working at levels of output which varied from 25 to 50 per cent greater than pre-war and were in the case of some products more than 100 per cent. Generally speaking the needs of the vehicle manufacturers were being met and the "back log" of service orders was being rapidly reduced to reasonable proportions.

The Madras Electric Supply Corporation, Ltd., held its annual general meeting on 20th December. Mr. K. A. Scott-Moncrieff, chairman, stated that the value of the property transferred to the Government of Madras was being calculated by Merz & McLellan. In the meantime the company had received £1,000,000 from the Government on account of the purchase price. This was subject to increase or decrease when the value had been finally determined.

Marco Refrigerators, Ltd.—Speaking at the recent annual meeting, Mr. A. E. Leach (managing director) said that during the year additional production space had been acquired by the purchase of Tudor Works, Byfleet, which not only increased the company's production, but afforded improved facilities for important services such as research and development, and tropical testing. Their export trade continued to expand. During the year the technical staff had been engaged in perfecting new and improved designs of various products, and these were now in production.

Crabtree Electrical Industries, Ltd.—The consolidated profit and loss account for the nine months ended 31st July, incorporating the accounts of J. A. Crabtree & Co. for twelve months, and J. A. Crabtree (Proprietary) for five months, records a net trading profit of £280,932. Sundry income brings this figure to £283,826. The net trading profit of J. A. Crabtree & Co. was

£282,807, compared with £239,372. Taxation took £131,091 and £65,970 was placed to general reserve. A final dividend of 7½ per cent is to be paid, making 17½ per cent (same, including bonus), and £115,262 (£111,732) is carried forward.

Waygood-Otis, Ltd., has announced an interim dividend of 20 per cent (against 17 per cent).

The Morgan Crucible Co., Ltd., has declared an interim dividend of 3¾ per cent (unchanged).

Pye (Ireland), Ltd., has announced an unchanged interim dividend of 5 per cent.

Telephone Rentals, Ltd., is paying an interim dividend of 4 per cent (same).

New Companies

Smith & Russell (Coseley), Ltd.—Registered 16th December. Capital £1,500. To acquire the business of Smith & Russell carried on by C. V. Smith, J. Smallman and P. H. Rees at 4, Birmingham New Road, Coseley, Staffs, and to carry on the business of electrical engineers and contractors, electricians, radio engineers, etc. Directors: C. V. Smith, J Smallman and P. H. Rees. Regd. office: 4, Birmingham New Road, Roseville, Coseley, Staffs.

C. W. Lewis' (Leeds), Ltd.—Registered 18th December. Capital, £5,000. To acquire the business of an electrical and mechanical engineer carried on by C. W. Lewis at Leeds. The permanent directors are: C. W. Lewis, 49, Brudenell Grove, Leeds, 6, and A. L. F. Lewis, 8, Church Street, Market Harborough. Secretary: Olive M. Lewis. Regd. office: 49, Brudenell Grove, Leeds, 6.

Morgan Radio, Ltd.—Registered 17th December. Capital, £500. To acquire the business of a radio and electrical engineer carried on by E. W. Morgan at Hatfield. The permanent directors are: E. W. Morgan (chairman) and Kathleen A. Morgan, The Cedars, St. Albans Road, Hatfield. Secretary: E. W. Morgan. Regd. office: 89, St. Albans Road, Hatfield.

McGadie & Mackenzie, Ltd.—Registered in Edinburgh, 11th December. Capital, £500. Electrical and mechanical engineers, etc. Directors: A. McGadie, 76, Kelvin Drive, Glasgow; E. M. Mackenzie, 39, Gardner Street, Glasgow; and N. P. McGadie, 42, Old Dumbarton Road, Glasgow. Secretary: E. M. Mackenzie. Regd. office: 20, North Street, Glasgow.

Godwin (Stoke-on-Trent), Ltd.—Registered 14th December. Capital, £3,000. Manufacturers and dealers in electrical and mechanical apparatus and accessories and components, particularly radio sets and valves, etc. Directors: L. R. A. H. Godwin and Mrs. F. Godwin. Regd. office: 17, Liverpool Road, Stoke-on-Trent.

R. F. Sweeney Radio, Ltd.—Registered 14th December. Capital, £30,000. Manufacturers and dealers in electronic apparatus and repairers and hirers of electrical and mechanical apparatus and accessories, etc. Directors: R. F. Sweeney (permanent managing director and chairman) and J. Sweeney. Regd. office: 133, Anthony Road, Saltley, Birmingham, 8.

C. R. Spouge, Ltd.—Registered 15th December. Capital, £10,000. Electrical engineers and contractors, installation contractors, lighting specialists, wireless and television engineers and service agents, etc. Directors: C. R. Spouge, Mrs. L. E. Spouge, R. B. Heaton and Peggy Heaton. C. R. Spouge is governing director. Secretary: Peggy Heaton. Regd. office: 11-12, Cornhill, Lincoln.

F. C. Robinson & Partners, Ltd.—Registered 4th December. Capital £4,000. Manufacturers of and dealers in electrical, thermionic, electronic and mechanical devices, apparatus and machinery, electrical and mechanical engineers, etc. Directors: F. C. Robinson and T. A. Robins. Solicitors: Wilfred Taylor & Hindle, Manchester.

Liquidations

Aldomic Electrics, Ltd.—Particulars of claims by 28th December to the liquidator, Mr. R. J. Barnett, Assurance Buildings, Rutland Street, Leicester. Meeting 11th January at the offices of the Trade Protection Society, New Street, Leicester, to receive an account of the winding-up by the liquidator.

Bankruptcies

W. E. Bernadis, 6, Atlas Place, Cardiff, electrician, formerly trading as Winbern Electrical Contractors, 26, Charles Street, Cardiff.—Receiving order made 16th December, 1948, on a creditor's petition.

W. E. Holloway, "Riverview," Burton Road, Ness Holt, Wirral, and trading as Dominion Electric Heating Co. at 23, Market Street, Birkenhead, electrical contractor.—Trustee, Mr. R. C. Johnston, 59, Hamilton Square, Birkenhead, appointed 17th December, 1948.

W. H. Tordoff, residing and carrying on business at 10, Burnett Avenue, Manchester Road, Bradford, electrical engineer.—Last day for receiving proofs for dividend 5th January. Trustee, Mr. G. F. Morris, Hallfield Chambers, 71, Manningham Lane, Bradford, Official Receiver.

STOCKS and SHARES

STOCK Exchange quotations have come through a testing year with a good deal of credit. Industrials lost ground on balance, but are finishing well above their lowest levels. Gilt-edged securities are near the best prices of the year. Shareholders dispossessed during the period of railway and electricity supply interests, can now see proper value, at least, for their compensation stocks. British Transport 3 per cents., issued in January at par, opened at a discount of 2½ points, have since been below 94 and are now 100. British Electricity "threes" 1968/73 have converted an initial discount of 1½ points, in April, into a premium of 2¾ points over par to-day. They touched 96 in the interval.

Industrial Markets

Most industrials were at their best in the first of the past twelve months, thanks to the migration of money from the newly-issued Transport Stock in search of a better yield. Subsequent reaction was checked by activity at the time of the electricity take-over, which, in its turn, gave way to mid-summer depression caused by the Berlin crisis. Since then, markets have acquired a high degree of immunity to international tension and economic anxiety. Buyers of ordinary shares have refused to be dismayed for long by dividend limitation, or by the official deflation policy. With Marshall Aid considerations, and a generally encouraging succession of company results, the weight of money has pushed prices steadily upwards since the early autumn.

Equipment and Manufacturing

In view of the high national "priorities" for electrical generating plant and other equipment, it is natural that the leading electrical engineering shares, which fulfil most of the other qualifications for the first-class equity, should have remained this year among the first favourites of the industrial market. They have depreciated, as the following table shows, but to a comparatively moderate extent:—

Company	27th December 1947	27th December 1948	Rise or Fall
	s. d.	s. d.	s. d.
Associated Elec. Industries	87 6	78 3	− 9 3
Crabtree Electric ...	46 0	43 0	− 3 0
Crompton Parkinson...	30 6	27 6	− 3 0
Elec. Construction ...	50 6	53 9	+ 3 3
English Electric ...	56 3	48 9	− 7 6
G.E.C.	95 0	90 0	− 5 0
Revo	53 6	60 9	+ 7 3
Reyrolle	68 3	61 3	− 7 0

Cable and Telephone

Shares in the principal manufacturers of electrical cable and telephone equipment have given a reasonably good account of themselves, thanks partly to excellent annual reports from this section of the electrical market. Falls, however, outnumber rises, as a representative group of prices illustrates:—

Company	27th December 1947	27th December 1948	Rise or Fall
	s. d.	s. d.	s. d.
Automatic Telephone	67 0	63 3	− 3 9
British Insulated Callenders	40 6	36 0	− 4 6
Enfield Cable	38 3	36 0	− 2 3
Ericssons	45 0	45 0	—
Hellyes	26 0	25 0	− 1 0
Johnson & Phillips ...	76 3	70 6	− 5 9
Siemens	34 6	35 6	+ 1 0
Telegraph Construction	52 6	48 9	− 3 9
Telephone Manufacturing	10 6	10 3	− 3

Communication Stocks

Cable and Wireless ordinary stock has risen persistently throughout the year, in anticipation of the negotiations, to begin on 12th January, for the settlement of Government compensation to the nationalized undertaking. Of the others in this table, Anglo-American Telegraph stocks have been influenced by the tax dispute with Western Union. Here are a few comparisons:—

Stock or Share	27th December 1947	27th December 1948	Rise or Fall
Anglo-Amer. pref. ...	130	122½	− 7½
Cable & Wireless pref.	121½	125½	+ 4
Do. ord.	177½	215	+ 37½
Great Northern ...	27½	21	− 6½
Marconi Marine ...	32s. 6d.	31s.	−1s. 6d

E.M.I.'s Distinction

Electric & Musical Industries shares are worth to-day very much the same as they were twelve months ago. Most others in the radio group have had a poor year. This table shows the net fluctuation in a variety of shares:—

Company	27th December 1947	27th December 1948	Rise or Fall
Brush	7s. 6d.	7s. 3d.	− 3d
Cossor	18s. 6d.	11s. 0d.	− 7s. 6d.
Decca	41s. 3d.	22s. 9d.	− 18s. 6d.
E.M.I.	20s. 0d.	20s. 6d.	− 3d.
Ever Ready	39s. 0d.	37s. 0d.	− 2s. 0d.
Lancs. Dynamo ...	6	5½	− ½
Tube Investments ...	7½	6¾	− ¾
Walsall Conduits ...	51s. 3d.	57s. 6d.	+ 6s. 3d.

Electricity Supply

Railways and Load Shedding. Uniform Scottish Tariffs

Carlisle. — STREET LIGHTING. — The borough surveyor is to prepare a scheme for illuminating London Road from Dudson's Terrace to Mayfield Avenue with mercury vapour discharge lighting.

Darlington.—LOAD-SHEDDING IN RAILWAY WORKSHOPS.—The Northern Regional Board for Industry has taken exception to a statement that the railway repair shops at Darlington belonging to the Railways Executive should not take part in any electricity load-shedding. A report by the Board stated that in the first instance there had been difficulty in getting the railway shops to agree to load-shedding, but the necessary arrangements had eventually been put into operation. The Railways Executive, it stated, had informed the shops' managements that they were exempt from load-shedding. The Regional Board for Industry contended that while it was correct for certain railway apparatus such as signals to be excluded from shedding, the railway workshops were in the same category as commercial undertakings and should be treated in the same manner. The Regional Board is to make representations on the matter.

Newcastle-upon-Tyne.—STREET LIGHTING. Electric lighting in Stamfordham road will cost £9,000.

Stokesley (Yorks). — EXTENSIONS.—The North-Eastern Electricity Board has informed the Rural District Council that supplies of electricity will be made available in two years to Battersby, Battersby Junction, Kildale and Ingleby Greenhow.

Scotland. — UNIFORM TARIFFS. — The North of Scotland Hydro-Electric Board announces a revised system of tariffs by which some 88 per cent of all classes of consumers will pay at uniform rates. Consumers affected are those in areas where electricity is produced mostly from steam power or water power, such as Aberdeen, Dundee, Perth and Inverness, most of the rural area south and east of the Caledonian Canal, Morar, Lochalsh, Easter Ross and East Sutherland. A uniform three-step tariff will be available for domestic consumers which, for the above areas will be: First 9 kWh per room per quarter at 5½d; nine times the number of 5½d kWh at 1d; and additional kWh at ¾d. In areas supplied from diesel plant, i.e., the Islands and some parts of the Western Highlands, the charges are slightly higher because of the high cost of generation and distribution. The domestic tariff will remain at 6d, 1d and ¾d per kWh. It is explained that a considerable proportion of the Board's electricity is generated from coal and diesel oil and if the cost of fuel rises, there will be a general revision of the average price per kWh. On the other hand, it is hoped to introduce another and lower step of the block tariff as more water-power schemes come into commission.

OBJECTIONS WITHDRAWN.—The Inverness County Council has withdrawn its objections to the Garry and Moriston schemes of the North of Scotland Hydro-Electric Board but expresses concern about the flooding of houses and agricultural and forestry land.

South Molton.—INSTALLATION COSTS.—The Rural District Council has deferred for one month a proposal that rents should be increased to cover an installation cost of £213 for electricity in Council houses at Burrington.

TRANSPORT

Austria. — RAILWAY ELECTRIFICATION.—The electrification has begun of the last stretch (Attnang-Puchheim) of the Vienna. main railway line from the west to Vienna. It is expected that the first electric trains from the Swiss borders to Vienna will run early in the summer of next year. This development is part of the plan for the electrification of the whole railway system of Austria, which should be completed within twelve years.—*Reuter.*

Newcastle-on-Tyne. — TRAMWAY ABANDONMENT.—Early in 1949 tramcars on the Heaton Road route are to be replaced by the City Council with trolley buses. Afterwards the only city trams still operating will be in the Scotswood Road area.

Electricity Output

THE Ministry of Fuel and Power statement for the week ended 17th December, 1948, shows that 949.5 million kWh was sent out for public supply from solid-fuel fired stations, compared with 944.3 million in the preceding week and 945.4 million in the week ended 19th December, 1947. Total output for the 50 weeks up to the date of the returns was 40,316.3 million kWh, against 37,183.2 million in the corresponding period of 1947. Stocks of coal at electricity undertakings at 18th December amounted to 4,215,000 tons compared with 4,267,010 tons a week before.

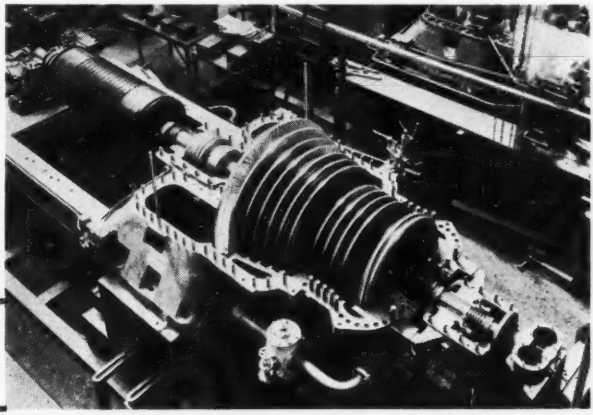
Heavy Plant Production

RECENT B.T.H. EXPORT CONTRACTS

DURING a recent visit to the Rugby works of the British Thomson-Houston Co., Ltd., industrial correspondents of the British national Press were shown a great deal of work in progress for overseas customers, apart from orders being carried out for the home market, and mention was made of a number of orders recently secured from many parts of the world.

It was stated in the course of the inspection of the heavy plant factories that one of two 18,750-kW turbo-generators for the Iraq Petroleum Co. had recently been completed and an order had now been received for a third set. A similar unit for Gourepore, India, and a 15,000-kW set for Hong Kong, were other notable orders which had been carried out.

Generating plant in hand for South Africa includes duplicate sets for Bulawayo (15,000 kW) and Colenso (25,000 kW). Two 3,500-kW extraction type turbo-alternators ordered by Australian paper manufacturers bring the number of these machines now in hand for these customers up to five, two of which are expected to be in commission shortly.



One of the two B.T.H. propulsion turbo-alternators for the Canadian Pacific vessel "Princess Marguerite."

The largest of many orders for hydro-electric plant received during the year covers the complete equipment—turbines, alternators, transformers, switchgear and auxiliaries—for the Los Peares power station of Fuerzas Electricas del Nordeste, Spain. The power station will house three B.T.H. 62,400-kVA vertical alternators driven by turbines supplied by Boving & Co., Ltd., as sub-contractors. Another order from Spain is for three 6,500-kVA vertical alternators with associated transformers and switchgear.

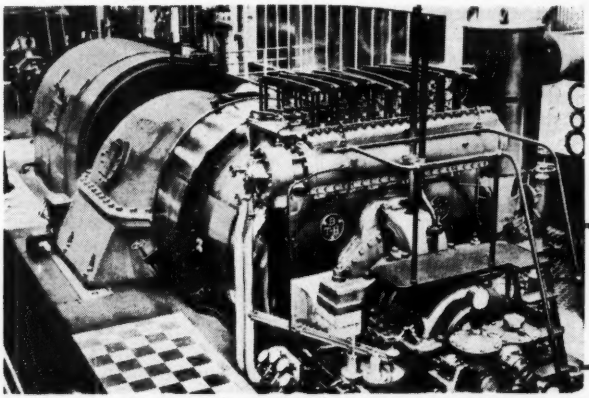
Other overseas orders for hydro-electric equipment include four vertical 16,700-kVA sets for the Owen Falls Scheme, Uganda, and an 18,000-kVA vertical waterwheel alternator for the Bardufoss power station, Norway. During this year three 4,375-kVA sets have been shipped for the Muhammadpore station, India.

Among the marine work carried out recently has been the propulsion machinery for the sister ships of the Canadian Pacific Railway Co., *Princess Marguerite* and *Princess Patricia* which are now nearing completion. Each of the ships is equipped with B.T.H. 15,500-s.h.p. twin-screw turbo-electric propelling machinery. Direct-current diesel-electric propulsion has been represented by the despatch to Australia of an equipment operating on the constant-current series system. This equipment, for which the company has supplied all the electrical gear and reduction gearing, will replace the existing drive in the *Barrenjoey*, a double-ended ferry owned by the Port Jackson & Manley Steamship Co., operating in Sydney Harbour. An identical equipment for the conversion of the double-ended ferry *Balgowlah* will be despatched next year.

Heavy Plant Production—*continued*

Complete electrical equipment for five floating dredgers, destined for France, has been supplied to Verschure & Co., Amsterdam. Each equipment includes a 1,000-kVA, three-phase, 50-cycle transformer for supplying the 380-V drives from a 13,500-V shore supply.

A good deal of work is in hand in connection with rolling-mill drives. One contract is for a two-speed induction motor rated at 1,500/1,500 h.p., 990/590 r.p.m., for driving a Rhodesian finishing mill for merchant bars. Electrical equipment for a tandem cold strip rolling mill has been ordered by the Australian General Electric Pty. Co., Ltd., for Australian Iron & Steel, Ltd., Port Kembla, New South Wales. This mill will have six motors, totalling 12,350 h.p., supplied from two synchronous motor-generator sets. The order also includes the electrical equipment for a hot wide strip finishing mill, six d.c. motors totalling 23,500 h.p. being required. These will be supplied from three synchronous motor-generator sets.



View of the "B" station of the Ahmedabad Electricity Co., showing the two 15,000-kW turbo-alternators installed this year. Two similar sets are on order.

POWER PLANT FOR TURKEY

TWO of the three British steam turbo-alternators in the Catalagzi power station, Turkey, are now in operation and the third was expected to be started up before the end of the year, much earlier than was originally reported. The station has been erected to serve the Zonguldak coal basin and north-west Anatolia.

The steam plant consists of three boilers, capable of supplying 220,000 lb. of steam per hour at 595 lb./sq. in. and 840 deg F. The plant uses pulverized coal on the unit system. The three turbines, each of 20,000-kW c.m.r. and 80 per cent. rating for maximum economy, have three-stage feed heating and gland heating, with an ejector, drain coolers, and unit evaporators, exhausting at 28·9 in. vacuum. Cooling water is obtained from an artificial lagoon on the shore of the Black Sea.

Each turbine drives a 20,000-kW main alternator generating at 11 kV, and a 1,500-kW house alternator generating at 3 kV. A 500-kW diesel-engine set with 1,875-kVA transformer is provided for stand-by service to the station auxiliaries. The main alternators are directly connected to 11/66-kV step-up transformers, controlled by air-blast switchgear of 750-MVA rupturing capacity. There is a double-circuit transmission line nine miles long to three substations at Karadon, Zonguldak and Kozlu which are equipped with 66/15-kV step-down transformers and 66-kV air-blast and 15-kV metalclad switchgear.

The main contractors for the scheme were the Metropolitan-Vickers Electrical Co., Ltd., and the principal sub-contractors include : Babcock and Wilcox, Ltd. (boiler and coal handling plant); Holloway Bros. (London), Ltd. (buildings and civil engineering work, including the cooling water intake) ; and British Insulated Callender's Cables, Ltd. (overhead transmission line and all the cabling of the project).

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British Industries Fair

PROGRESS OF THE ELECTRICAL SECTION

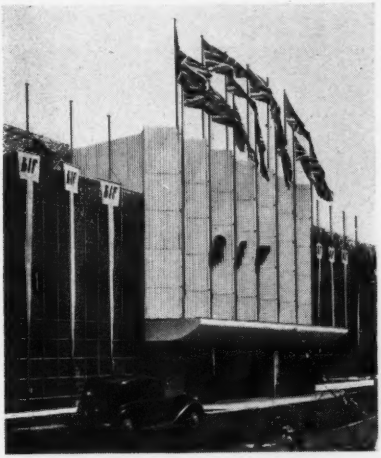
By F. G. NESBITT
(Chairman, Electrical Exhibitors' Committee)

THE time at the disposal of a buyer visiting a trade fair in another country is usually very limited, and naturally he desires to put it to the best possible use. Therefore, if he is wise, he plans his visit so that his time is more or less equally divided between those sections of the fair in which his main interests lie, due allowance being made for more detailed inspection of items of outstanding interest, such as new devices or exhibits including recent developments or the latest manufacturing processes.

The aims of the wise exhibitor are therefore obvious—to present his goods in the most attractive manner, and in a way which will allow his customer to see them with the least expenditure of energy. Accordingly he must ensure the most comfortable conditions possible and make certain that the things the buyer most desires to see are so "highlighted" as to be readily available to his notice.

Those familiar with the British Industries Fair building at Castle Bromwich, Birmingham, will agree that it lends itself admirably to the exhibitors' needs in these respects. Originally, during the 1914-18 war, an aircraft hangar, it was taken over for the Engineering and Hardware Section of the Fair by the Birmingham Chamber of Commerce who, at the request of the Government, undertook the organization of this Section when, in 1920, it was decided that the Fair was now too big to be housed under one roof. This was then agreed to be the most suitable building readily available for the purpose and experience has proved the wisdom of that choice.

Although the building has been extended until it now houses under one roof the biggest display of engineering products on one floor in the world, the original form of construction has been preserved; structural features such as heavy supporting pillars, which are frequently such irritating obstructions at exhibitions, are absent. The visitor, on entering the building, is at once able to gain, through the wide unobstructed aisles extending from end to end of the Fair, an immediate impression of the size, scope and ordered layout of the exhibition, for in successive extensions the Fair authorities have enlarged the main building and wisely avoided adding those hidden bays and annexes which can transform a pleasant visit to a most annoying game of hunt-the-thimble. Regulations governing stand construction have always been very strict so that the visitor has a clear view from any point in the Fair and can pick out any stand he wishes to see and make his way to it with little difficulty



Main entrance to the Birmingham Section of the Fair

Since the first world war the number of exhibitors has multiplied and the need for segregation of the major industries into sections has become more apparent. The

British Industries Fair—*continued*

expansion of the Fair has been paralleled by the rapid growth of the electrical industry, so that it is natural that the Electrical Section should have become one of the most important of the four main groups into which the Castle Bromwich display is now divided. Within an area of nearly 60,000 sq. ft. can be seen the products of 150 electrical manufacturers from all parts of the United Kingdom: examples of almost everything of interest to the overseas buyer.

There are included electrical appliances for application to almost every domestic need; heavy duty cooking equipment catering for large institutions, such as schools, can be seen side by side with small cookers for families of two or three persons, or with equipment specially adapted for use in ships or aircraft where saving of space and weight is a vital consideration. Displays of domestic and commercial lighting installations reveal a wide range, from recent developments in fluorescent fittings to distinctive fittings of the more traditional type. Finally—that other feature of a good exhibition—every manufacturer can be relied upon to reserve some of his latest developments and designs for the Fair.

Use has been made of the open space adjacent to the Fair building to display to advantage electrical exhibits in their natural setting. Street lighting columns and lamps are shown in this section and the visitor will be impressed by the sight of large mobile electromagnetic cranes in action. Within the building the Electrical Section is situated next to the Heavy Engineering Section, since these two great industries have much in common.

So much for the actual exhibition and its layout: what has been done and is being done to ensure that the visitor's tour is made as comfortable and trouble-free as possible?

In the period since the war the Fair Management Committee, in common with organizers of the other major exhibitions throughout Europe, has been faced with an unenviable task. Accommodating and catering for large numbers of visitors for a short period each year calls for expert organization in normal times; in the few years following the war this organization has needed to be of the very highest order, for every year more and more buyers from overseas are coming to see what Britain can offer. Nevertheless improvements in the catering arrangements have been continuous from year to year until now they at least equal and possibly surpass the standards obtaining at any similar exhibition anywhere in the world.

View of the Electrical Section of the 1948 Fair

As is to be expected, such an exhibition is a great attraction to the layman and of past years the interest displayed by the public has increased to such an extent that in the interests of the trade buyer public admission has now to be controlled.

Last year an Overseas Buyers' Club was introduced at the Birmingham Fair for the first time. This is intended to be a specialized service reserved to the overseas buyer alone; there he may relax, obtain light refreshment and make such general enquiries as he needs and gain the

LOW OIL CONTENT HEAVY DUTY SWITCHGEAR

by G.E.C.

Accessibility of circuit breaker contacts.
Accessibility of hoist control switch.
Working on the current transformers.
Locking the automatic shutter mechanism.

THE GENERAL ELECTRIC CO., LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

British Industries Fair—*continued*

assistance of a qualified interpreter.

Naturally enough the overseas buyer wants to ask questions relating to import duties in all countries of the world, export quotas, invoicing requirements and a great many other matters calling for expert knowledge. All these can be dealt with at the special Enquiry Bureaux occupying central positions and staffed by officers of the Board of Trade and the Birmingham Chamber of Commerce.

Service to the overseas buyer commences, however, long before he leaves his country. Information concerning the Fair, travel facilities, etc., and advance catalogues are made available to him through all British commercial diplomatic officers and United Kingdom Trade Commissioners throughout the world. If he desires accommodation to be reserved for him he will be put in touch with the Central Bureau of Accommodation of the Birmingham Chamber of Commerce. Furthermore, he will be advised to make travel reservations, including the return passage, as early as possible before commencing his journey. The railway authorities, too, have co-operated in providing through trains from London and Castle Bromwich with the best dining facilities that can be provided at the present time.

In all its efforts the Fair Management Committee is supported by the Electrical Section. Indeed, for some long time, there has been in existence an "Electrical Exhibitors' Committee" which has received suggestions from electrical exhibitors and other sources for improvements and for the increased comfort of visitors.

For many years, with the exception of the Jubilee Year of King George V (1935), the British Industries Fair was held in February, but continuous representations were made, by the electrical exhibitors in particular, for the date to be changed to May or June. After the war, as an experiment, the date was changed to May, and the general feeling seems to be that this is an undoubted improvement. The next Fair will run from Monday, May 2nd, to Friday, May 13th, 1949.

Next year, as in the past, the Electrical Section is determined to maintain the high standard for which the Fair generally is noted and looks forward to welcoming all its old friends, and many new ones at Castle Bromwich in May.

PORTABLE TOOL KITS

TWO valve-seat grinding kits have been produced recently for export by S. Wolf & Co., Ltd. The No. 1 kit comprises one of the company's "EVG3" high-speed electric valve seat grinder, with starting switch, 15 ft. of three-core tough-rubber sheathed cable and a spare pair of carbon brushes; a precision diamond stone dresser; two stone sleeves; four coarse and four finishing valve-seat stones; five expanding pilots; and a pilot tommy bar. The equipment is suitable for grinding valve seats up to 3 in. diameter on i.c. engines.

Provision is also made for the accommodation of additional equipment, including valve refacer rocker arm and micrometer attachments and collets.

The No. 2 kit is designed for use on all popular makes of private car and commercial vehicles and is similar in general make-up to the No. 1 kit. The apparatus is housed in new mahogany waxed-finish cases.

Wolf No. 2 valve-seat grinding kit

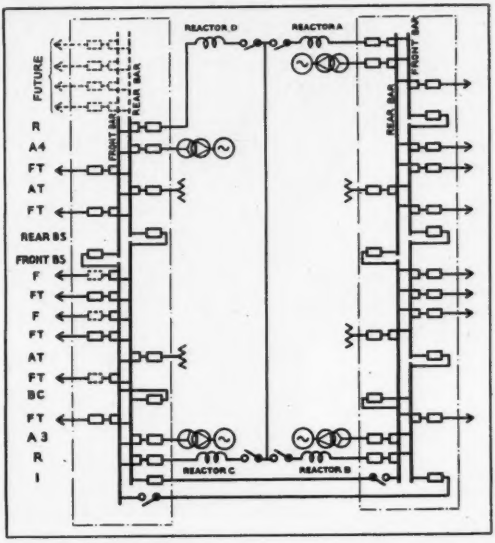
Another recent "Wolf" introduction is the "SD4c" ½-in. general duty drill which, by virtue of new methods of production and assembly, has been reduced in price to meet American competition.

Power Station Switchgear

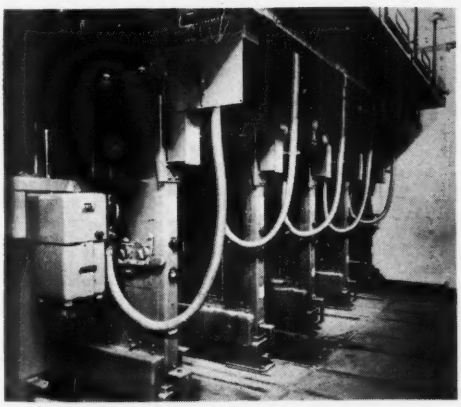
MODERN EXAMPLES AT KINGSTON

THE opening by His Majesty the King of the new power station at Kingston-upon-Thames was reported in the *Electrical Review* of 5th November. In the previous issue there appeared a description of the station in which reference was made to the main high-voltage switchgear, further particulars of which are given below. The conditions to be met included the incorporation in the scheme of 33-kV 500-MVA switchgear and remote control gear, of Ferguson Pailin manufacture, which was already on the site for the control of incoming feeders from the Wimbledon substation of the British Electricity Authority and outgoing transformer feeders.

The new switchgear, of the same make and rupturing capacity, is being installed in two stages. The first stage comprises nine additional 3-kV duplicate-busbar metal-clad units to control Nos. 1 and 2 alternators, each of 30 MW capacity, together with units for the control of two auxiliary station transformers and two reactor circuits. This additional gear has been installed in the existing switch house (extended) and the previously installed 33-kV switchgear has been modified and



Schematic diagram of ultimate switching arrangements

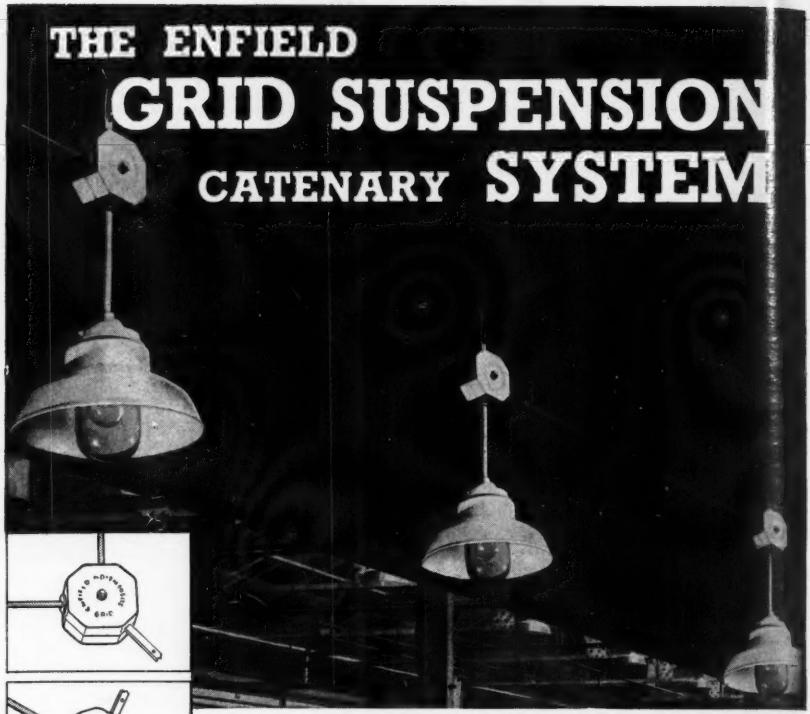


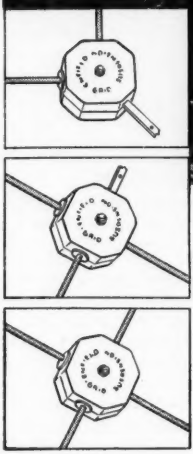
rearranged to form, with the new units, the first two sections of an ultimate four-section installation.

The 11-kV alternators are direct connected to transformers to raise the output voltage to 33 kV. The switchgear is sectionalized both on the front and rear busbars by bus-section units. The bus-section breakers will normally be open, the two sections of switchgear being coupled together by a set of three single-phase oil-immersed reactors forming a group rated at 10 per cent of 30 MVA.

Part of main 33-kV metal-clad switchboard in course of erection; one breaker lowered from busbars for testing and inspection

THE ENFIELD GRID SUSPENSION CATENARY SYSTEM





Catenary wiring cuts out conduit

The Enfield Grid Suspension system is a new and simplified method of installing electricity by overhead distribution using catenary cables and connection boxes. The steel-cored cables can be clipped to, or suspended from, existing steelwork and considerable distances can be spanned between supports. No conduit is necessary. The system effects great saving in time, labour and money.

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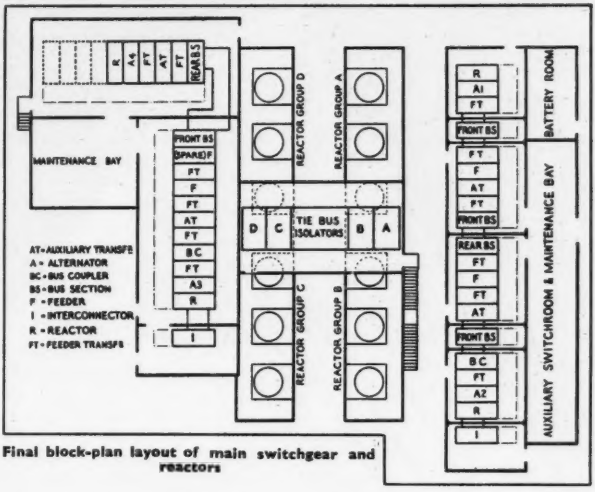
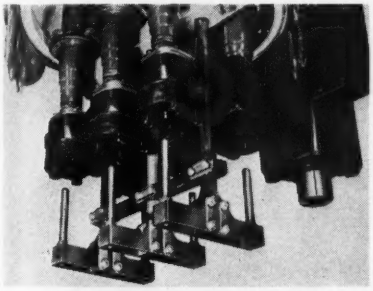
The second stage of the installation, at present in course of manufacture, will comprise sections "C" and "D," which are to be installed in a new adjacent switch house. These sections will control Nos. 3 and 4 alternators also of 30 MW, together with the associated auxiliary station transformers, reactor circuits and out going feeder equipments. At this stage sections "A," "B," "C" and "D" will be connected, through reactor groups and 33-kV air-break isolators, to a reactor tie busbar, to form a star-connected reactor system.

The layout of the switchgear has been designed so that the rated breaking capacity of 500 MVA is not exceeded as a result of the incorporation of the new power station in the switching system, and so that the breaking capacity of existing switchgear installed elsewhere on the external network is also not exceeded. The main switchgear comprises Ferguson Pailin type VTRP.32 compound and oil-filled vertically isolated units.



Final block-plan layout of main switchgear and reactors



One of the 33-kV oil circuit breakers, showing contacts, arc control features and condenser bushings

Off-load busbar selection is carried out by the physical transfer of the circuit breaker from one set of busbars to the other—an operation which can be carried out manually in under three minutes per unit. The switch units embody fully tested oil circuit breakers of the round-tank pattern, fitted with arc control.

All the 33-kV switchgear is being equipped with a new phase-comparison system of busbar protection. The contract also includes new control gear, together with neutral-earthing equipment, automatic voltage-regulator panels, load-summation equipment, etc.

FRACTIONAL H.P. MOTORS

A NEW range of fractional-horse-power motors has been produced by the Carlisle Electrical Manufacturing Co., Ltd., Eccles, Lancs, and shipments have already been made to "hard-currency" countries. The split-phase types are made in ¼-, ⅓- and ½-h.p. sizes and the capacitor-start models in sizes of ¼-, ⅓- and ½-h.p. The end covers and stator case are pressure die-cast in zinc-base alloy and it is claimed that the rotor construction is such as to make it indestructible under normal working conditions. The machines are fully protected and drip-proof. Ventilation is by a six-bladed steel stamping secured to the end of the rotor.

The 'Aldwych' and 'Albany,' catalogue No. AL 2431, house two 80 watt fluorescent tubes and auxiliaries. Besides providing diffused light through the side panels, they give a strong concentration of light below through lattice louvres which also screen the tubes from direct view from normal angles. All equipment is easy to get at and metal-work is corrosion-proof.

THROWING NEW LIGHT ON AN OLD PROBLEM . . .

One of the weightiest problems that faces the people who value the appearance of their premises is the problem of lighting. How to get lighting that is bright without being harsh, practical without being plain—and which gives full illumination without running up heavy electricity bills.

The new Crompton 'Aldwych' and 'Albany' fluorescent lighting units more than satisfy these conditions. The 'Aldwych' is a ceiling unit; the 'Albany' is a pendant unit. Both have reeded plastic side panels which provide pleasant diffusion of the bright fluorescent light. Both are light on electricity consumption and easy to maintain.

Crompton can offer a wide range of 2 ft., 4 ft. and 5 ft. fluorescent units of many types and in many styles to anyone who would like to end their lighting problems.

Crompton

FOR THE LATEST IN FLUORESCENT LIGHTING

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BRANCHES AND AGENTS IN MOST PRINCIPAL COUNTRIES OF THE WORLD

COOKERS and FIRES

OVERSEAS SALES OF BELLING PRODUCTS MAKE GREAT ADVANCE

SINCE Belling & Co., Ltd, intensified their export programme just under two years ago their sales of electric cookers and fires abroad have increased fivefold and the company can now claim to be one of the largest British exporters of this class of apparatus. Much of this success is attributable to the extensive market survey work which was carried out before embarking on the expansion programme. Representatives were sent out from this country to the United States, Canada, South American countries, Belgium, Switzerland Sweden, Norway, Spain and Portugal to study the special requirements of each market and to arrange for representation.

The company is a firm believer in sole agencies and has arrangements covering Australia, Belgium, Ceylon, Chile, Cyprus, East Africa (4), Ecuador, Egypt, Eire, Iceland, India, Iraq, Iran, Koweit, Malta, Mauritius, New Zealand, North Borneo, Pakistan, Palestine, Peru, Portugal, Sarawak, Siam, Singapore, South Africa (20), South Pacific Islands, Uruguay, Venezuela, West Africa (8) and West Indies. In every case these agencies have been arranged after personal contact which has also ensured the establishment of an efficient after-sales service, a feature which is particularly welcomed in the less developed areas of the world.

Our combined title picture shows (top) new "Baby Belling" cookers being assembled and (above) inserting the imitation log effect in the "Medieval" fires

The main cooker assembly lines

The Duralite Fluorescent Lamp is of British design and manufacture throughout and has been especially developed to meet the increasing demand for a fluorescent lamp of high efficiency, reliability and long life.

HIGHER LIGHT OUTPUT LONGER LIFE

Available in five standard colours: WHITE, WARM WHITE, SUMMERLITE, DAYLIGHT and SOFT-TONE

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the beauty lamp of the century.

Guaranteed FLUORESCENT LAMPS

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For the home, restaurant or hotel etc., the decorative effect of "SOFT-TONE" will be appreciated, for its pleasing mellow light enhances the richness of furnishings and fabrics.

The "WHITE" is the general purpose lamp under which colour values remain unchanged. It is equally suitable for shop counter and window display or for lighting large offices and factory areas.

For the intimate lighting of Beauty Salons etc., the "WARM WHITE" is most effective.

"SUMMERLITE" is close to natural light and ensures a very high degree of glareless illumination for assembly lines etc.

"DAYLIGHT" approximates to northern light.

Special colours, Green, Gold, Pink, Saffreen, Blue. and Red, can be supplied to order at 50% above list price.

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PRODUCTS

HI-CRAFT ELECTRICAL PRODUCTS LTD. 25 Manchester Square, London, W.1

'hough, generally speaking, the co ıpany's products are suitable for use an ywhere in the world, in some instances

(Above) All cookers are tested under load for 1½-2 hours. (Right) Wiring up the de luxe Model 64AB

modifications have had to be made to meet the special requirements of individual countries. For example, for the Australian market cookers have to have their grill-boilers with a wire mesh guard underneath to prevent any possibility of touching the bare elements: specially designed fuse compartments have also to be incorporated. Similarly in Scandinavia all fire elements have to be covered by wire grilles.

A considerable amount of attention has been paid to the preparation of suitable descriptive literature for the various markets, and catalogues, etc., are now available in French, Flemish, Spanish and Portuguese.

Hitherto the countries buying the largest quantities of Belling products have been Australia and South Africa. Belgium is another good customer, despite strong American and French competition, and the New Zealand market is improving, while with the slackening of the restrictions in South American countries the company's development work is just beginning to bear fruit. A certain amount of progress has been made in the very difficult United States and Canadian markets.

More than 70 per cent. of the output of the company's factory at Enfield is absorbed by export orders. About 80 per cent. of these are for cookers, the remainder being for fires and immersion heaters. The biggest success abroad are the new "Baby Belling" cooker (which is proving

A convoy of 249 cookers leaving the Belling works for Australia

particularly popular in countries where electricity supplies are restricted through lack of generating capacity) and the 3-plate standard model. Considerable interest is also being shown in the company's de luxe cooker with its exclusive features—interior oven lighting and inner glass door with foot opening device. Almost without exception the cookers are now being supplied with thermostatic oven control and most of them have a simmering device, sometimes on the grill-boilers as well as the boiling plates.

Packing cookers in the Export Despatch Department

A white body with black hob and base is now the attractive standard finish.

The reintroduction of the company's period imitation coal and log fires, the "Celtic," "Medieval" and "Adam," redesigned and constructed of new lighter materials has created a substantial demand in such countries as Australia and Belgium, as well as in Scandinavia and Switzerland.

Testing a "County" fire

In the latter countries, owing to the prevalence of central heating, the fires are mainly required for the sake of appearance and are accordingly frequently supplied without elements. Incidentally the log effect is particularly realistic. In most other countries, especially in South Africa and the Middle East, the question of cost largely enters into the matter and the demand is mainly for the cheaper, more utilitarian types, particularly the "County" reflector models. The post-war cream and black plastic model, the "Solray," is rapidly finding favour.

Recent stepping-up of production has enabled the company to get level with its orders and overseas buyers are now being offered a delivery period of 4-6 weeks for cookers and 2-3 weeks for fires and immersion heaters.

CERAMIC CAPACITORS

OVER half (56 per cent to be precise) of the output of the United Insulator Co., Ltd., who are pioneers in the manufacture of ceramic capacitors, is now going abroad to customers in the United States and many other countries. Making its own ceramics and silver solution, the factory at Tolworth, Surrey, can claim to be entirely self-contained.

Recently the company's range of capacitors has been extended both in the miniature and larger sizes. The smallest now available, 4·5 mm in diameter by 10 mm long, is made in capacitances up to 2,200 pF; the largest, 128 mm in diameter by 210 mm long, has a capacitance of 4,000 pF, being suitable for use on circuits taking 150 kVA in still air or 300 kVA in a forced draught of 10 ft. per sec. An exceptionally large number of hermetic seals is being sent abroad.

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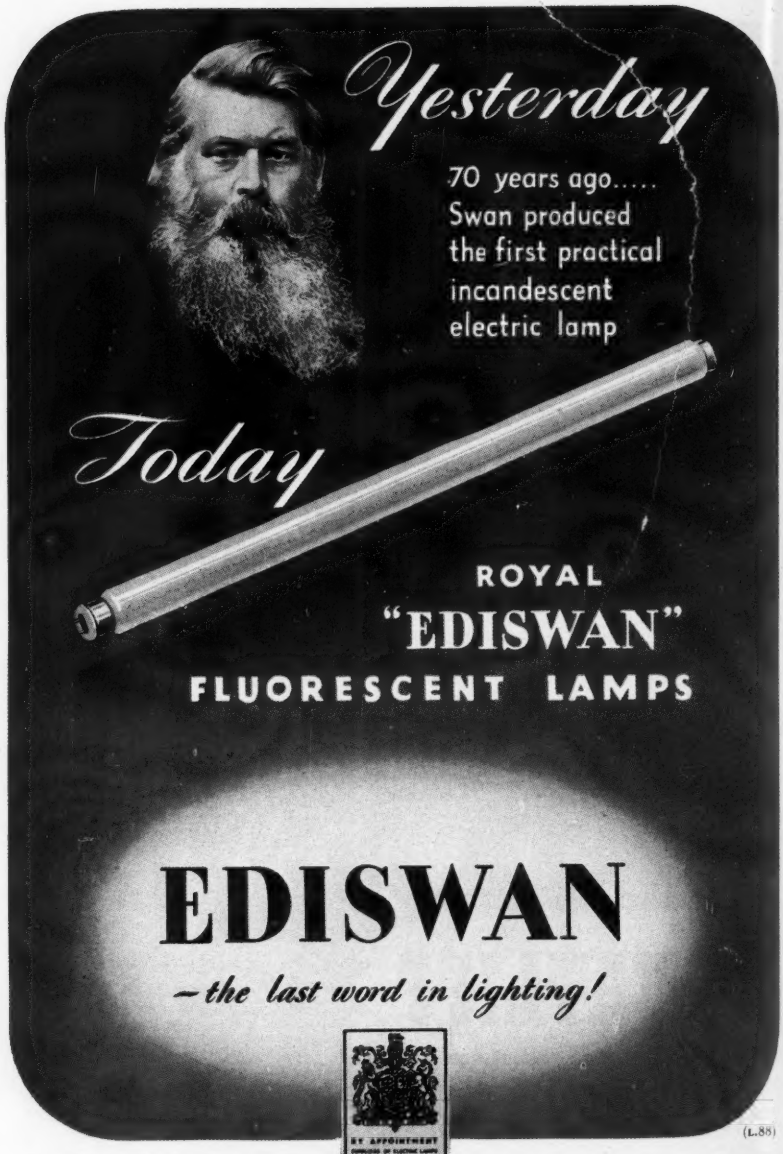
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Transformers for South Africa

RECENT PARSONS CONTRACT

THREE transformers were recently completed by C. A. Parsons & Co., Ltd., for South Africa. These are three-phase units rated at 9,000 kVA 88/6·6 kV, connected star on the high voltage side and delta on the low voltage side. The units are of the core type, the laminations being manufactured from low-loss electrical sheet steel; every lamination is coated on both sides with insulating varnish. Each limb has only a single row of clamping bolts, to eliminate short-circuited paths across the edges of the laminations, or in the core limb in the remote event of core bolt insulation failure.

The frames are of mild steel fabricated construction, incorporating square key bolts in the top and bottom yokes, no vertical tie bolts being used. The top frames are adjustable and the coil clamping pressure was fixed during the final stage of assembly of the units.

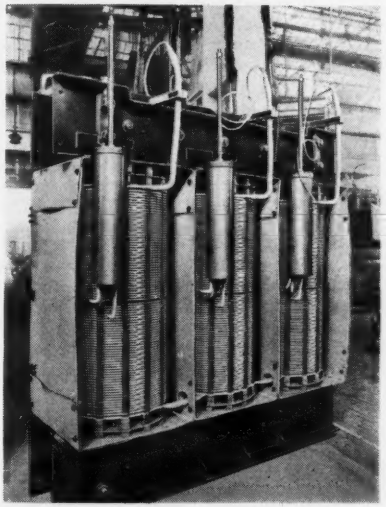
The windings are arranged in two concentric coil stacks. The l.v. windings are of the continuously wound disc type and are insulated from the core and h.v. windings by pressboard cylinders. The h.v. windings are also of the continuous disc type, wound without joints and terminate in paper-insulated shields.

Tappings for 84 kV and 80 kV are provided in the middle of the h.v. windings and are brought out from the front of the coils to a bridging contact off-circuit tapping switch. The switches are operated by means of handwheels.

The tanks were fabricated from mild steel boiler plates, all the seams being welded. The plates are reinforced by two rolled steel sections. Jacking lugs are fitted to facilitate the handling of the units on site and provision for fitting haulage lugs is made in the jacking lug assembly to permit the movement of the complete transformers by winches.

Cooling is by detachable radiators mounted round the tank, with isolating valves fitted at the top and bottom headers of each radiator.

The h.v. line bushings are of the outdoor, independently oil-filled condenser type, fitted with arcing horns. The h.v. neutral and l.v. bushings are of the outdoor self-contained air-filled type.



Assembled core and windings (h.v. side) of a Parsons 9,000-KVA 88/6·6-KV transformer.

Each unit is fitted with a conservator and in the pipe connecting it to the main tank is inserted a double-float Buchholz relay. In addition to an explosion vent each unit is also fitted with a dehydrating breather of the oil-sealed silica gel type.

"BRUSH" EQUIPMENT FOR EXPORT

AMONG the more important recent export orders for electrical equipment, on which work has started, the Brush Electrical Engineering Co., Ltd., has received the following:—

One 3,000 kW axial-flow geared turbo-alternator for Bilbao, Spain; a similar unit of 2,000 kW output for a South African sugar factory; four 250-kW diesel-driven alternator sets, six transformers from 50 to 100 kVA and control switchgear for Aswan Dam, Egypt; twenty-one 85-h.p. industrial pattern motors for the South African Railways and Harbours; 110 30 h.p. and 40 h.p. flameproof motors for Poland; two 3,000-kVA 33/11-kV three-phase transformers, arranged for the later addition of

"Brush" Equipment—*continued*

on-load tap changing gear for the City of Bulawayo, Southern Rhodesia; two 2,500-kVA 33/6·6-kV on-load tap changing transformers for the City of Durban; and twenty-four 250 MVA 6·6-kV vertical isolation drawout oil circuit breaker equipments for the City of Johannesburg.

These are in addition to the Russian contract for diesel generating sets, valued at about £5½ million, just announced.

EXPORT-TYPE COOKER

AS the outcome of the company's export manager's research in Canada, Latin America and the Near East, Parnall (Yate), Ltd., have produced a new export cooker, type "E.C.10." From the first production sample batches of the cooker are being sent to a number of territories.

Investigations showed that the chance of selling the conventional English-type cooker in these markets was small. Furthermore, certain of the countries concerned are already producing cookers themselves, cookers of very different design from the English models. Their ideas have been influenced by American or Continental designs which both favour drop down oven doors and comparatively larger oven space, and do not embody grill-boilers.

The "E.C. 10" was produced with these considerations in mind. The actual cooking space provided is 2,900 cu. in. (11¾ in. by 17 in. by 14 in.). The loading is 4,000 W and the oven has quickly removable grid supports and elements. The drop-down door is well balanced and lagged. Elements are fitted at top and bottom; the top one can be used for grilling.

Parnall "EC.10" cooker

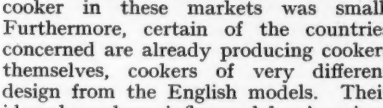
Three plug-in solid hotplates are provided—two 8 in. diameter (1,800 W) and one 6½ in. diameter (1,000 W). Three-heat switches and a three-stage thermostat, with self-indicating control knob and pilot light, are employed.

Overall dimensions are 36 in. high by 23 in. wide by 25 in. deep.

Aluminium die castings are largely used in the construction which reduces the weight of the cooker.

MOTOR DEVELOPMENTS

AMONG recent developments of Higgs Motors, Ltd., is the fractional h.p. motor worm gear unit illustrated. This is made in one size only



Higgs fractional h.p. worm gear unit

and comprises a standard drip-proof three-phase motor to which is flange-attached a self-contained reduction gear-box. The motor shaft is given additional support by a third bearing in the gearbox. The high carbon content steel worm engages with a chill cast phosphor bronze wormwheel, ensuring long life and noiseless operation. The available full-load torque varies slightly with the gear ratio but is approximately 120 lb/in. based on a 12-hour working day. On the same basis the h.p. output ranges from 0·05 at 23 final shaft r.p.m. to 0·20 at 200 r.p.m.

The same company is also producing a new line of electric propeller fans, a.c. and d.c., for the usual voltages, ranging in size from 15 in. to 36 in. diameter. The motors are totally enclosed and the fans, of the four-blade type, are fabricated from sheet steel.

Higgs Motors have completely redesigned their range of single-phase capacitor start machines.

NEW BOOKS

Preparation of Technical Papers : Industrial Electronics

Technical Literature. By G. E. Williams, B.Sc. (Eng.), A.M.I.E.E. Pp. 116. Geo. Allen & Unwin, Ltd., 40, Museum Street, London, W.C.1. Price 7s 6d net.

This book, by the head of the editorial department of the Institution of Electrical Engineers, is primarily intended to aid engineers and physicists in preparing papers for the professional Press. The number of its readers should, however, be much greater than this statement might imply, as it provides a reliable guide to everybody who has to express himself in writing with logic and precision.

The first consideration, it is pointed out, is that the writer shall decide to whom his paper is addressed and then set out to interest and persuade his readers, an important point being that new information should be introduced in terms of what is already known. A short essay on psychological principles indicates the background against which the appeal has to be made. Sound hints are given on how scientific data may be presented with an objectivity that permits communication of an author's enthusiasm for his subject.

The bulk of the book deals with such practical matters as arrangement of ideas, paragraphing, choice of words, avoidance of libel, space estimation, the use of symbols and the inclusion of illustrations. There is a good bibliography. This book will undoubtedly fulfil its author's purpose of assisting the development of a clear and readable style.—C. O. B.

Industrial Electronics Reference Book. By Electronics Engineers of the Westinghouse Electric Corporation, America. Pp. x + 680; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 45s in U.K.

This very large volume is written by a group of American engineers, each an expert in the particular field with which he deals. The subject is now so vast that this is the only way in which such a book can be written ; any attempt on the part of one writer to cover the whole field (and there have been many) must expect only a qualified success. The object of the book is to give engineers and others concerned with electronic devices the underlying fundamentals, and to show the applications and limitations of the devices themselves ; more attention is rightly given to the basic principles than to descriptions of equipment.

In a short review it is impossible even to list the subjects dealt with in the 36 chapters ; it must suffice to say that there are few omissions, and that modern developments such as magnetrons, velocity modulation tubes, and betatrons receive full attention. It is perhaps odd, however, that discharge lamps are considered almost solely as radiators of ultra-violet. The standard of mathematics required is not likely to be too high for the average engineer or science graduate.

Not the least valuable parts of the book are the extensive bibliographies at the end of each chapter, and the excellent index. The diagrams and production generally are good.—V. J. F.

Handbook of Industrial Electronics. By J. Markus and V. Zeluff. Pp. 272; figs. and index. McGraw-Hill Publishing Co., Ltd., Aldwych House, Aldwych, London, W.C.2. Price 39s in U.K.

Another book by the American authors of "Electronics for Engineers" cannot fail to arouse interest among those concerned with the design of electronic apparatus. It contains a selection of practical circuits which have been published in *Electronics* and a few other periodicals during the past ten years or so. Clearly, the intention is that the circuits given should form the starting point for more advanced or modified designs, each one being described with sufficient detail to enable the competent engineer to grasp the features of operation.

A wide range of conventional techniques is covered, conveniently grouped and indexed. In addition a considerable number of less well-known designs are discussed, including circuits for control, measurement, metal location, photoelectricity, telemetering and ultrasonics.

With a range of subjects so vast as that attempted in this volume, every aspect cannot be fully explored, but it is disappointing that no chapter is included on what is often the most troublesome feature of industrial design, namely protection devices. Some space might also have been usefully allocated to the applications of magnetic amplifiers, crystal rectifiers and indirect methods of d.c. amplification. It is surprising that no reference is made to the "long-tailed pair" circuit which is so effective both as a d.c. amplifier and as a meter stage, although several more complicated but less stable devices are discussed. However, despite such obvious omissions the work is likely to prove a useful addition to the designer's library.—A. F. B.

E.D.A.'s Fun Fair

AT the Schoolboy's Own Exhibition, which opens at the Horticultural Hall, Westminster, tomorrow, the British Electrical Development Association has staged a veritable fun fair of automatic machines, enabling the visitors to learn in easy stages how electricity does some of the many things for which it is now used in homes, shops, offices and factories. The display, at first sight, appears to include all the usual pin table machines, working models, flashing lights, and even the newest all-electric "What the Butler Saw," but with the difference that the visitors acquire useful knowledge. One device demonstrating the effect of ultra-violet rays on fluorescent materials bears the title "Dick Barton's Secret Electric Message Decoder," and, like nearly all the devices there can be operated by a push button.

To bring home the problem of load shedding, visitors are invited to generate electricity to supply an imaginary factory by means of a hand-driven dynamo. Switches are provided to bring in a domestic load of lighting and heating, the effects being produced in real earnest—the dynamo becomes much harder to turn, and illumination difficult to maintain, until fires are switched off.

An electrician's work bench includes an electricity meter dismantled to reveal its construction, and also some fuse blowing and replacing devices which will certainly fascinate and educate. Another exhibit illustrates the principle of the variable-heat electric hotplate, varying degrees of illumination of a hotplate being produced by turning the usual control knob. A "Careers Corner" contains literature, charts and other information on training schemes.

Diesel-Electrics for Ceylon

THE North British Locomotive Co., Ltd., in association with the General Electric Co., Ltd., as supplier of the electrical equipment, has received an order for eight 625 h.p. diesel-electric shunting locomotives for the Ceylon Government Railway. They are of the double four-wheel bogie type (Bo-Bo), with single cab, and have a starting tractive effort of 35,000 lb.

A combined main and auxiliary generator unit designed by the G.E.C. is used in these locomotives, with the auxiliary generator overhung on the shaft of the main machine. The unit is driven by a Paxman "12 R.P.H." turbo-charged diesel engine through a Welman-Bibby flexible coupling. Four G.E.C. self-ventilated axle-hung traction motors, connected in parallel, are supplied from the main generator and drive the axles through double-reduction gears. The auxiliary generator provides the supply for the radiator fan, fuel transfer pump, priming pump, and exhauster motors, as well as charging the battery for the control circuits, starting and other services. Automatic control is provided between the engine governor and the generator field rheostat, which ensures that the engine cannot be overloaded.

The provision of two "dead man's" pedals and the arrangement of the controller enable the locomotives to be driven from either side of the cab. It is possible to start the diesel engine in an emergency by supplying the generator with current generated by the traction motors while the locomotive is mechanically propelled.

The locomotives are 34 ft long over headstocks, and have a maximum height of 12 ft 6 in and maximum width of 9 ft. The total weight is 52 tons and the maximum speed 20 m.p.h.

Power Plant Contracts

DURING the past month contracts have been placed for generating station, switching and transforming station and transmission equipment amounting in the aggregate to £5,786,431. The principal contracts include the following:—

General pipework and sundry auxiliary plant, Fulham station (Aiton & Co.); steam receiver, steam and feed piping, valves and drain conservation system, Clarence Dock (Liverpool) (Stewarts & Lloyds); ash and dust handling plant, North Tees, ash handling plant, Southwick "B," and No. 3 and 4 boilers, Rye House (Babcock & Wilcox); superstructure for main and ancillary buildings, Poole (Sir Robert McAlpine & Sons); superstructure for main buildings and river works, Skelton Grange, Leeds (Kirk & Kirk); structural steelwork, Littlebrook "C" and structural steelwork, Fulham (Dorman Long & Co.); main circulating water pumps and equipment, Littlebrook "C" (Drysdale & Co.); foundations, basement and ground floor, Usk Mouth (John Morgan (Builders), Ltd.); coal handling plant, Prince Rock "B," Plymouth, and coal handling plant, second section, Croydon "B" (International Combusion); reconstruction of coal sidings and additional coal handling plant, Freeman's Meadow, Leicester (Mitchell Engineering); reinforced concrete cooling towers, Rye House (Davenport Engineering Co.); and 33 kV 1,500 MVA and 33 kV 750 MVA switchgear, Clydes Mill, and 45 MVA 132/33 kV transformers, Hinksford sub-station (G.E.C.).

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1943

BRITISH Thomson-Houston Co., Ltd. (General Electric Co.).—"Electrical timing apparatus." 18291. 4th November, 1943. (613905.)

1944

British Thomson-Houston Co., Ltd.—"Electrical apparatus for testing the power transmitted by tractive elements such as the wheels of a vehicle." 133. 11th January, 1943. (614157.)

General Electric Co., Ltd., V. J. Francis and E. H. Nelson.—"High-pressure mercury-vapour, electric projection lamps." 5388. 22nd March, 1944. (613906.)

1945

Bendix Aviation Corporation.—"Electrical servo control systems." 1212. 31st December, 1943. (613909.)

Power Jet (Research & Development), Ltd., and W. E. P. Johnson. — "Combustion-turbine power-plant." 5520. 5th March, 1945. (614160.)

British Thomson-Houston Co., Ltd.—"Electric motor control systems." 14156. 7th June, 1944. (613917.)

General Electric Co., Ltd., and R. C. Moore.—"Means for producing lighting effects." 19454. 30th July, 1945. (614224.)

C. G. Lowen and P. Telco.—"Means for selectively predetermining the effective periods of operation of apparatus operated by electrical energy." 21264. 20th August, 1945. (613922.)

F. Watson (Aktiebolaget Ljungstroms Angturbin).—"Variable-speed power transmissions." 22075. 28th August, 1945. (614225.)

M. Pegard.—"Control devices for machines requiring control of mechanical actions and electrical indicating and other effects." 22331. 10th February, 1942. (613925.)

R. A. Yeo, A. G. D. Watson, J. H. Jones and C. S. Wright.—"Radio communication systems." 25340. 29th September, 1945. (613927.)

British Thomson-Houston Co., Ltd.—"Vitreous envelopes or tubes and method of protecting the same." 34126. 26th December, 1944. (613933.)

British Thomson-Houston Co., Ltd.—"Ultra-high-frequency electric circuits." 34601. 29th December, 1944. (614000.)

1946

General Electric Co., Ltd., A. D. Mackay and A. Thornhill.—"Liquid resistance controllers." 5038. 18th February, 1946. (614170.)

Sperry Gyroscope Co., Inc.—"Apparatus for measuring high-frequency power." 6298. 28th February, 1945. (614005.)

F. Rimmington.—"Electric clocks." 6607. 4th March, 1946. (614237.)

G. J. Gulde.—"Electrical pick-ups." 6922. 6th March, 1946. (614238.)

Imperial Chemical Industries, Ltd., and H. R. Ronnebeck.—"Control of intermittently operating devices particularly electric switches." 7012. 6th March, 1946. (614239.)

H. C. Hansen.—"Radio receivers." 7209. 29th December, 1945. (613945.)

Philips Lamps, Ltd.—"Thermionic tubes having a secondary-emission electrode." 7441. 3rd July, 1941. (613946.)

Standard Telephones & Cables, Ltd.—"Electric built-up character facsimile communication systems." 8183. 24th April, 1943. (614172.)

Det Norske Aktieselskab for Electrokemisk Industri.—"Closed electric furnaces." 8804. 16th June, 1944. (613949.)

Crompton Parkinson, Ltd., and A. H. Wickham.—"Variable-ratio gears applicable for use in prepayment mechanism for electricity meters, and the like." 10070. 1st April, 1946. (613950.)

Standard Telephones & Cables, Ltd. (Standard Telephon und Radio Akt.-Ges.).—"Alternating-current signal receiving circuits." 10481. 4th April, 1946. (Convention date not granted.) (613951.)

Philips Lamps, Ltd.—"Amplitude-limiters for electrical oscillations." 10603 6th November, 1941. (613952.)

P. A. Macchioni.—"Synchronous electric hammers." 11258. 21st March, 1945. (614242.)

Marconi's Wireless Telegraph Co., Ltd., and T. H. Price.—"Radio-transmitters." 11887. 17th April, 1946. (614243.)

Philips Lamps, Ltd.—"Process for the mechanical treatment of bodies consisting of two or more conductors surrounding each other and separated from each other by insulating material." 14033. 8th October, 1941. (613959.)

Sadir-Carpentier.—"Facsimile and like communication systems." 14448. 31st May, 1945. (613961.)

Marconi's Wireless Telegraph Co., Ltd.—"Television and like pick-up tubes." 15564. 19th April, 1945. (614248.)

Standard Telephones & Cables, Ltd.—"Radio air navigation system." 15651. 5th March, 1945. (613964.)

Automatic Telephone & Electric Co., Ltd., and G. T. Baker.—"Electrical signalling systems." 15906. 25th May, 1946. (614177.)

Det Norske Aktieselskab for Elektrokemisk Industri.—"Electric smelting furnaces." 16184. 5th June, 1945. (613966.)

P. M. J. Spielmann—"Electrical connectors of the plug-and-socket type." 19151. 29th June, 1945. (614012.)

Ekco Products Co.—"Portable electric hand lamps." 19350. 2nd March, 1946. (614065.)

Philips Lamps, Ltd.—"Junction boxes." 19379. 6th June, 1942. (613973.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—"Optical elements." 19382. 10th October, 1939. (614255.)

Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—"Optical systems comprising a concave spherical mirror and a correcting element." 19386. 30th May, 1942. (614256.)

Standard Telephones & Cables, Ltd.—"Frequency modulated oscillating system." 19413. 15th September, 1945. (614066.)

J. Pearson.—"Electric-discharge lamps." 19545. 1st July, 1946. (Cognate application 1437/47.) (614027.)

J. H. Runbaken and W. Torrance.—"Assembly of electrical transformers, chokes and the like in casings." 19562. 1st July, 1946. (614028.)

N. Sandor.—"Sound reproducing apparatus." 19662. 1st July, 1946. (614034.)

S. I. Hitchcock.—"Cam-actuated electric contact-breakers." 19667. 1st July, 1946. (614035.)

Rauland Corporation, C. S. Szegho and N. Glyptis.—"Electron-beam tubes." 19671. 1st July, 1946. (614036.)

English Electric Co., Ltd., and S. Taylor.—"Gas-blast circuit-breakers." 19763. 2nd July, 1946. (614075.)

Pirelli-General Cable Works, Ltd., and R. J. Jordan.—"Coaxial cables." 19894. 3rd July, 1946. (614055.)

Philips Lamps, Ltd.—"Method of manufacturing magnetic cores." 20010. 16th June, 1942. (614181.)

"Electric condensers." 20011. 15th July, 1942. (614076.) "Slidable-core inductance coils." 20012. 15th July, 1942. (614077.) "Electric welding." 20024. 29th May, 1942. (614182.)

Plessey Co., Ltd., and M. J. Murphy.—"Electric switch handle for holding interchangeable instruments used in dentistry." 20064. 4th July, 1946. (614082.)

English Electric Co., Ltd. and R. D. Ball.—"Dynamo-electric machines, electro-magnetic slip couplings, electro-magnetic brakes and the like." 20124. 5th July, 1946. (614091.)

British Thomson-Houston Co., Ltd.—"Metallic rectifiers." 20135. 9th July, 1945. (614096.)

Schild & Co. Soc. Anon.—"Device for the electric winding-up of the barrel spring of a clockwork mechanism." 20148. 11th January, 1946. (614098.)

General Electric Co., Ltd., and E. S. Friedlander.—"Heteropolar inductor alternators." 20182. 5th July, 1946. (614104.)

A. Abbey (Eitel-McCullough, Inc.).—"Electron tubes and method of making same." 20188. 5th July, 1946. (614105.)

Sulzer Freres Soc. Anon.—"Gas-turbine plants." 20198. 19th July, 1945. (614106.)

J. Preece.—"Clips for fixing electric conductors." 20202. 5th July, 1946. (614199.)

R. Tanberg.—"Method if manufacturing continuous electrodes." 20207. 8th May, 1943. (614107.)

S.U. Carburetter Co., Ltd., R. L. Kent and K. R. Davies.—"Mechanism for controlling the supply of fuel to internal-combustion turbines." 20223. 6th July, 1946. (614202.)

Standard Telephones & Cables, Ltd.—"Electrical measuring system." 20246. 7th July, 1945. (614259.)

A. C. Bernard and W. Thomson.—"Brake devices for electric winches." 20264. 6th July, 1946. (614112.)

Cinema-Television, Ltd., and O. Bartle.—"Methods and apparatus for sealing plates or shells to the main body of the envelope of an electron-discharge device." 20284. 8th July, 1946. (614261.)

Standard Telephones & Cables, Ltd., and J. Foster.—"Electron-discharge devices." 20300. 8th July, 1946. (614264.)

Philips Lamps, Ltd.—"Fluorescent screens and electric-discharge tubes comprising such screens." 20335. 22nd July, 1942. (614122.)

Philips Lamps, Ltd.—"Potentiometers." 20337. 1st August, 1942. (614268.)

Varley Dry Accumulators, Ltd., and L. Fuller.—"Electric secondary batteries." 20389. 8th July, 1946. (614126.)

J. L. Gratzmuller.—"Snap-action electric switches." 20390. 7th July, 1945. (614206.)

P. Cibie.—"Electric contacts." 20428. 21st April, 1939. (614130.)

Westinghouse Electric International Co.—"Electronic control devices." 20474. 14th July, 1945. (614216.)

British Thomson-Houston Co., Ltd.—"Magnetic clutches." 20500. 11th July, 1945. (614136.)

Metropolitan-Vickers Electrical Co., Ltd., and G. J. Scoles.—"Electrical timing circuits." 20507. 9th July, 1946. (614219.) "Thermionic valve control circuits." 20510. 9th July, 1946. (614220.)

Metropolitan-Vickers Electrical Co., Ltd., and G. Shand.—"Thermionic valve control circuits." 20512. 9th July, 1946. (614221.)

A. Abbey (Aktiebolaget Rydo Mekaniska Verkstad.).—"Electric devices for heating liquids." 20516. 9th July, 1946. (614273.)

General Electric Co., Ltd., and H. M. Nelson.—"Dielectric and eddy current heating." 20616. 10th July, 1946. (614281.)

Sigma Electrical Manufacturing Co., Ltd., and V. L. Parry.—"Mountings for fluorescent tubular and like lamp supports." 20698. 11th July, 1946. (614284.)

Hoover, Ltd., W. C. Bell and R. H. H. Press.—"Suction cleaners." 20897. 12 July, 1946. (614297.)

1948

F. Watson (Aktiebolaget Ljungstroms Angturbin).—"Variable-speed power transmissions." 13408. 28th August, 1945. (Divided out of 614225.) (614302.)

Amended Specifications

British Thomson-Houston Co., Ltd.—"Bearings for vacuum or low pressure vessels." 542665.

Standard Telephones and Cables, Ltd.—"Method of making selenium elements." 570347.

Next Week's Events

Monday, 3rd January

BIRMINGHAM.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Centre. "Factors Influencing the Design of High-Voltage Air - Blast Circuit Breakers," by C. H. Flurscheim and E. L. L'Estrange.

Tuesday, 4th January

BIRMINGHAM.—Chamber of Commerce, New Street, 7 p.m. Television Society (Midlands Centre). "Television Applications other than Entertainment," by Dr. W. Summer.

GLASGOW.—Electrical Society of Glasgow. "Police Wireless," by Lt. J. Cooper.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. "Factors Influencing the Design of High - Voltage Air - Blast Circuit Breakers," by C. H. Flursheim and E. L. L' Estrange.

Wednesday, 5th January

LONDON.—At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m. Institution of Heating & Ventilating Engineers. "Heating and Ventilating Plants in German Underground Installations," by L. C. C. Rayner.

MIDDLESBROUGH.—Cleveland Scientific & Technical Institute, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "The Lightning Protection of High-Voltage Transmission and Distribution Systems," by H. M. Lacey.

PORTSMOUTH.—City Council Chambers, Clarence Parade, 6.30 p.m. I.E.E. Southern Centre. "Centralized Ripple Control on High-Voltage Networks," by T. W. Ross and R. M. A. Smith.

Thursday, 6th January

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 5.45 p.m. Illuminating Engineering Society (Cardiff Centre). Presidential address by J. M. Waldram.

WORCESTER.—Talbot Hotel, 7.15 p.m. Worcester Electric Club. "Auto Electrics," by A. E. Davis.

Friday, 7th January

BIRMINGHAM. — Illuminating Engineering Society (Birmingham Centre). Annual dinner.

Saturday, 8th January

BIRMINGHAM. — Grand Hotel, 3 p.m. Birmingham Electric Club. Children's Party.

WAKEFIELD. — Association of Mining Electrical & Mechanical Engineers (Yorkshire North-West Branch. A mechanical paper, by C. Hotchkiss.

CONTRACT INFORMATION

ACCEPTED TENDERS AND PROSPECTIVE ELECTRICAL WORK

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Argentina. — BUENOS AIRES. — Directorate-General of Water and Electric Power. Turbo-generators and other plant for the following hydro-electric projects:—Tender No. 318/48: 200-kW hydro station at Los Puquios, Province of San Luis (closing date, 15th February, 1949). Tender No. 315/48: 1,500-kW station at Los Quirogas, Province of Santiago del Estero (closing date, 11th March, 1949). Tender No. 328/48: Station at Poman, Province of Catamarca (closing date, 18th February, 1949). Tender No. 302/48: Station at Aminga, Province of La Rioja (closing date, 25th January, 1949). Tender No. 303/48: Station at Rio Saugil, Province of Catamarca (closing date, 25th January, 1949). The Export Promotion Department's reference is E.P.D. 22340/47. Ten/73.*

Bath.—12th January. Education Committee. Electrical installation in new infants' school, Moorlands estate. (24th December.)

Manchester.—12th January. North-Western Electricity Board. Electric water heaters for twelve months ending 31st January, 1950. (24th December.)

Madeira.—28th February. Administrative Commission for Hydraulic Power. Hydro-electric schemes at Serra de Agna and Calheta, including constructional work, plant, etc. (E.P.D. 43314/48. Ten/69.)*

Panama.—Director of the Panamanian National Airport. 26 miles of telephone cable. (E.P.D. 43912/48. Com/1549.)*

South Africa.—JOHANNESBURG.—17th February. Railways Tender Board. Main switchboard comprising 14 units, two subsidiary switchboards and protective equipment. (E.P.D. 44173/48. Ten/79.)*

DURBAN.—4th March. City Electricity Department. Metering equipment. (E.P.D. 44045/48. Ten/64.)*

West Hartlepool. — Education Committee. Electrical installation, new Seaton Lane Primary School. Mr. S. M. Richmond, borough architect, Municipal Buildings.

* Specifications may be inspected at the Export Promotion Department, Thames House North, Millbank, S.W.1.

Orders Placed

Chesterfield.—Corporation. Accepted. Stage lighting and sound effects (£450) and new switchboard (£550) at the Corporation Theatre. —Strand Electric & Engineering Co.

Gillingham (Kent).—Electrical installations in 20 houses.—Lauray Electrical Co.

London.—L.C.C. Accepted. Installation of four electric passenger lifts in three blocks of dwellings at Tulse Hill estate, Lambeth.—Express Lift Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Research laboratory; D. Napier & Sons, Ltd., Westfields Road.

Becontree.—Houses (60), Frizlands Avenue, for L.C.C.; Wates, Ltd., 1258, London Road, S.W.16.

Beeding (Sussex).—Reconstruction of cement works for Associated Portland Cement Manufacturers, Ltd.; John Laing & Son, Ltd., Mill Hill, N.W.7.

Bournemouth.—With reference to the notice published in our issue of 3rd December, relating to the erection of buildings on the site of the Metropole Hotel, Levy & Franks, Ltd., inform us that they have no knowledge when the buildings in question are being reinstated.

Burnley.—Nursery, Hargher Clough site; borough engineer.

Houses, Pasture Close; J. & A. Parker, builders, Hall Street.

Weaving shed and offices; Blue Printers, Ltd., Woodbine Mills, Sycamore Avenue.

Burton-on-Trent. — Factory, Wellington Street; Hodgson & Hodgson, Ltd., Wesley Grove, Carrington, Nottingham.

Cardiff.—Houses (1,100), Thornhill Road, Llanishen; city surveyor.

Office block, Kingsway and Greyfriars Road; Prudential Assurance Co., Ltd., Holborn Bars, E.C.1.

Chelmsford.—Two blocks of flats, Melbourne Avenue; borough engineer.

Cheltenham.—Factory, Presbury Road; Golden Crunch Biscuit Co., Ltd., Factory Centre, Birmingham, 30.

Chichester.—Houses (38), Kingham Avenue site, for T.C.; Warings, Ltd., London Road, Hilsea.

Chippenham.—Conversion of Mansion House, Greenways, to maternity hospital, for Mid-Wilts Hospital Management Committee; F. I. Bowden, architect, County Hall, Trowbridge.

Consett.—Houses (500) near Gloucester Road for the U.D.C.; surveyor.

Cumberland.—Practical rooms at the Lapstone Road County School for the C.C.; county architect, 15, Portland Square, Carlisle.

Durham.—Temporary classrooms at the Dinsdale Park Residential School; county architect, Court Lane, Durham.

Schools for the E.C. at Boldon Colliery and Whitburn; county architect, Court, Lane, Durham City.

East Sussex.—Primary school, Haywards Heath; E. A. Verger, county architect, County Hall, Lewes.

Falkirk.—Baths, changing rooms, Falkirk Iron Co. (£17,500); manager.

Extensions at British Aluminium factory, Bainsford (£493,000); manager.

Glasgow.—Extensions to Netherton works, Anniesland; J. Busby, architect, 7, Kirk Crescent, Old Kilpatrick.

New buildings, Balmoral Street; Harland & Wolff, Ltd., Govan Shipbuilding Works.

Glendale.—Houses (30); R.D.C. surveyor.

Harlow.—Houses (98) for Harlow Development Corporation, Ltd.; Gee, Walker & Slater, Ltd., builders, 100, Park Lane, W.1.

Hetton-le-Hole.—Community centre and public hall for U.D.C.; A. H. Fennell, architect, Bridge End Chambers, Chester-le-Street.

Hexham.—Houses (20), Horsley, for R.D.C.; W. Dixon & Son, 1, Collingwood Street, Newcastle.

Ilkley.—Grammar school; West Riding county architect, County Hall, Wakefield.

Isle of Ely.—Schools, Whittlesey, Witchford and Wisbech; county architect, March.

Keighley.—Foundry and stores; Harold Beck & Sons, Marley Street.

Lanchester (Co. Durham).—Houses (70); R.D.C. surveyor.

Littlehampton.—Housing scheme, Horsham Road, for Admiralty; Civil Engineer in Chief's Dept., Chamberlain Way, Pinner, Middx.

London.—SOUTHWARK.—Flats (138), Penrose Street; Wm. Moss & Sons, Ltd., builders, North Circular Road, N.W.2.

STRAND.—Reconstruction, Gaiety Theatre; O. H. Leicester, architect, 21, Bloomsbury Square, W.C.1.

WEST NORWOOD.—Flats (68) and houses (12), Knights Hill site, for Lambeth B.C.; Howes & Jackman, architects, 1, Verulam Buildings, Gray's Inn, W.C.1.

Manchester.—Factory, Gorton Road; Long & Crawford, Ltd., 2, Gorton Road.

Middlesbrough.—Occupation centre near the remand home; borough engineer, Town Hall.

Motherwell.—Houses (50), Watling Street (£94,000); burgh surveyor.

Musselburgh.—Houses (80); burgh surveyor, Municipal Offices, High Street.

Newcastle-on-Tyne.—Bakery for Carricks (Caterers), Ltd.; Middlemiss Brothers, builders, Stepney Bank.

Mechanical engineering block, King's College; Nox, Ltd., 55, New Bond Street, London.

Extensions for Cressling & Co., Clayton Street; L. J. Couves & Partners, Carliol House.

Conversion of "Moorfields" into students' hostel for the E.C. (£7,000); education architect, 31, Northumberland Road.

Housing estate, Newton Park; Marshall & Tweedy, Grainger House, Blackett Street.

Newport (I.O.W.).—Flats, Church Road, Wootton; K. E. M. Souter, architect, 11, Lind Street, Ryde.

North Ormesby (Yorks).—Additions, North Ormesby Hospital, for the Newcastle Hospital Board, Osborne Road, Newcastle-on-Tyne.

North Riding.—Repairs and renovations, 150 voluntary schools (cost £100,000); county architect, County Hall, Northallerton.

Northumberland.—Reorganization scheme at Shilbottle Colliery for the Northern Coal Board, Newcastle-on-Tyne, including new engineering workshops and offices.

Norwich.—Factory, St. Stephen's Church Lane; Page Bros. (Norwich), Ltd., Mile Cross Lane.

Houses (54) and flats (36), Earlham (West) estate; John Cochrane & Co., Ltd., builders, 39, Victoria Street, S.W.1.

Oxhey.—Further houses (1,000), L.C.C. housing site; Unit Construction Co., Ltd., builders, 38, Millbank, S.W.1.

Poole.—Concrete products factory, Newtown; Limmer & Trinidad Lake Asphalt Co., Ltd., Steel House, Tothill Street, S.W.1.

Prudhoe-on-Tyne.—Houses (10); U.D.C. surveyor.

Reading.—Primary school, Peppard Road, for E.C.; E. G. V. Hives, architect, 3, Cork Street.

Redcar.—Houses (52); R. Hilton, borough engineer.

Salop.—Primary school, Dawley; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Wallsend.—Houses for the T.C. at Wallsend West Farm; J. H. James, builder, Wallsend (50), and J. Armstrong, Builder, Gosforth (50).

West Hartlepool.—Maintenance and engineers' workshop, Longhill, for Batchelor, Robinson & Co.; Turnbull & Rowe, architects, 6, Scarborough Street.

Hotel, Stockton Road, for J. Nimmo & Son; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Aswan Hydro-Electric Plant

A SHORTAGE of hard currency has been hindering progress on the Aswan hydro-electric scheme for the past three months, reports *Reuter*. The main problem arises from the import of large turbines, generators and electrical equipment. Importation from the United States is out of the question, first because it is considered more expensive, and secondly, it is said to be "less effective" than European plant.

The Egyptian Government has been advised to import turbines and generators from Great Britain or Belgium, but as Belgian francs are as "hard" as Swiss francs, orders will probably be placed in the United Kingdom.

Other electrical equipment is expected to be imported from Switzerland and settled in accordance with the recent trade agreement with that country, unless it can be found elsewhere.

It is expected that complete documents will be issued on or about 1st January and that tenders will be receivable by 1st April. In order to give prospective tenderers an early opportunity of visiting the site and beginning their investigations on sources of materials and methods of carrying out the work, a preliminary document has been prepared giving a general description of the works, with a note of the approximate quantities involved. Copies of this may be obtained free of charge from the Hydro-Electric Power Department, Ministry of Public Works, Maamalel-Sukkar Street, Garden City, Cairo, or from the consulting engineers, Kennedy & Donkin, 12, Caxton Street, London, S.W.1.

Complete Range of

OVERHEAD LINE *Equipment*

from

E.H.T.

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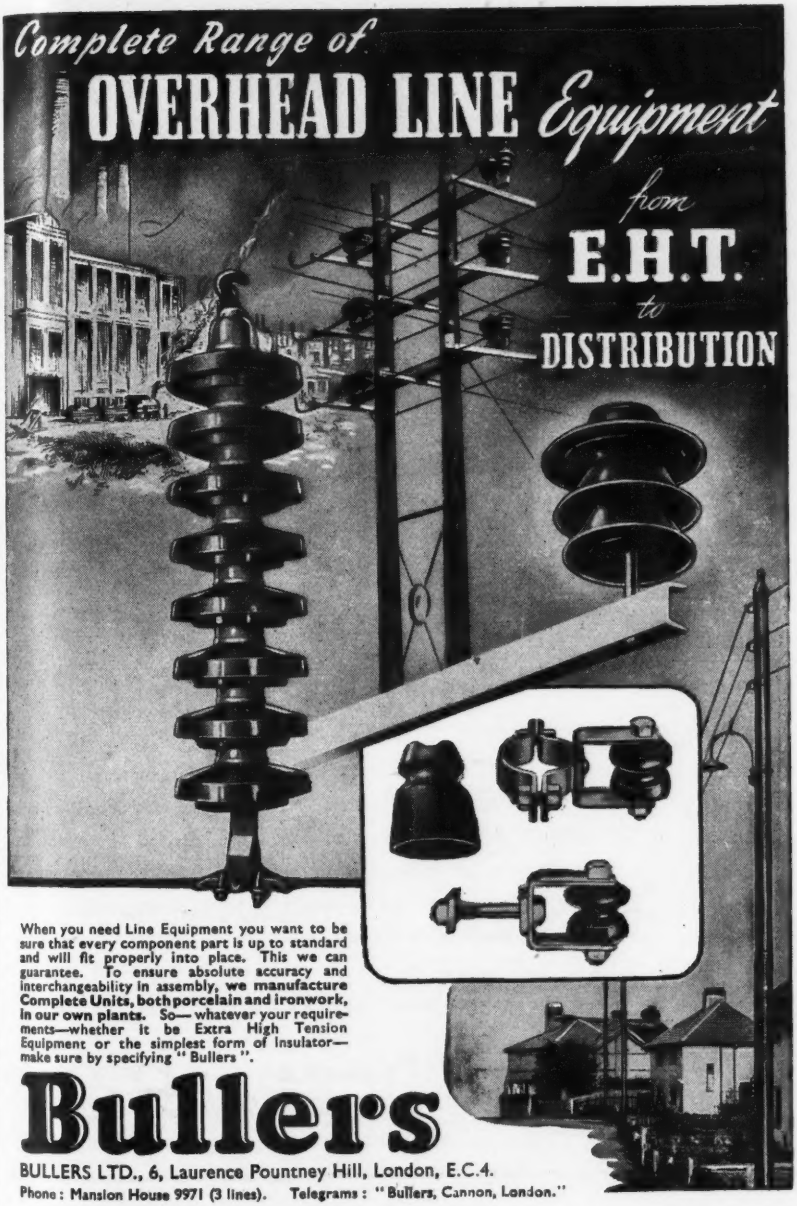


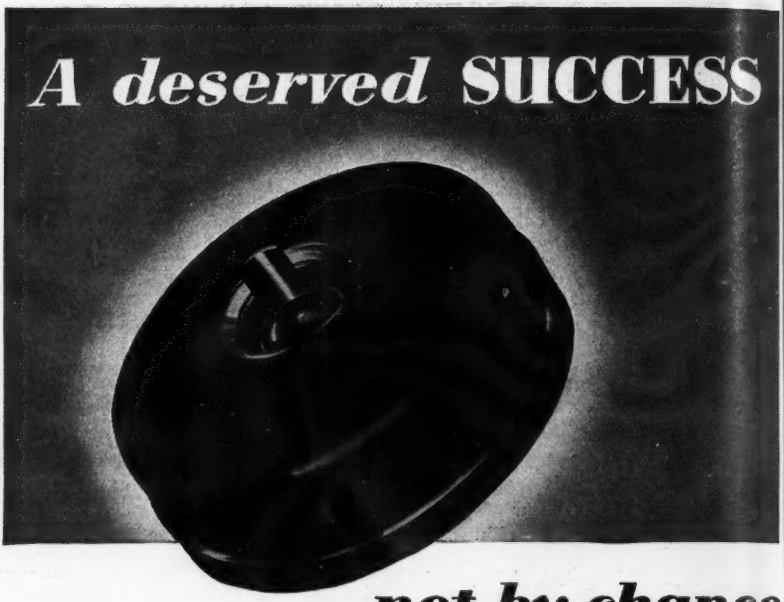
When you need Line Equipment you want to be sure that every component part is up to standard and will fit properly into place. This we can guarantee. To ensure absolute accuracy and interchangeability in assembly, **we manufacture Complete Units, both porcelain and ironwork, in our own plants.** So— whatever your requirements—whether it be Extra High Tension Equipment or the simplest form of Insulator—make sure by specifying "Bullers".

Bullers

BULLERS LTD., 6, Laurence Pountney Hill, London, E.C.4.

Phone: Mansion House 9971 (3 lines). Telegrams: "Bullers, Cannon, London."

A deserved SUCCESS



not by chance – but by DESIGN!

FOR USE ON A.C. ONLY

Careful and extensive research into microgap switching for alternating current — extreme mechanical and electrical efficiency — silence in operation — precision manufacture coupled with exhaustive routine tests in all stages of production — *THESE* are the reasons why the "*MUTAC*" switch is now universally accepted as the greatest advance in switch design of recent years.

SURFACE AND FLUSH MOUNTING TYPES AVAILABLE — SEND FOR LEAFLET S9868

"MUTAC" *Silent* **A.C. SWITCHES** *by* **G.E.C.**

(Regd Trade Mark)

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS for insertion in the following Friday's issue are accepted up to **First Post on Monday**, subject to space being available, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1. **CLASSIFIED** advertisements are PREPAID at 3/- per line (approx. 7 words) per insertion; ***ONLY OFFICIAL AND GOVERNMENT ANNOUNCEMENTS CAN NOW BE DISPLAYED***—42/- per inch. Where the advertisement includes a Box Number this counts as two words and there is an additional charge of 1/-. CHEQUES AND POSTAL ORDERS should be crossed and made payable to ELECTRICAL REVIEW.

SITUATIONS WANTED.—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion. **REPLIES** to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment.

SITUATIONS VACANT

Vacancies advertised are restricted to persons or employments excepted from the provisions of the Control of Engagement Order, 1947.

BRITISH ELECTRICITY AUTHORITY

MIDLANDS DIVISION

APPLICATIONS are invited for the following appointments at the new Walsall Generating Station:—

(a) BOILER HOUSE SUPERINTENDENT—Class "J," Grade 6, commencing salary £662 per annum.
(b) ASSISTANT MECHANICAL MAINTENANCE ENGINEER—Class "J," Grade 8A, commencing salary £526 per annum.
(c) ASSISTANT ELECTRICAL MAINTENANCE ENGINEER—Class "J," Grade 8A, commencing salary £526 per annum.
(d) 5 SHIFT CHARGE ENGINEERS—Class "J," Grade 7, commencing salary £606 per annum.
(e) 5 JUNIOR SHIFT ENGINEERS—Class "J," Grade 9A, commencing salary £526 per annum.
(f) 5 SHIFT CHARGE ENGINEERS—Class "J," Grade 9A, commencing salary £423 per annum.
(g) SHIFT CONTROL ROOM ASSISTANTS—Salary in accordance with the N.J.I.C. Schedule—28.25d per hour, plus Shift enhancemnt.

Applicants for post (a) should have had a thorough mechanical training and a wide experience in the efficient operation and maintenance of boiler house equipment. Preference will be given to Corporate Members of the Institution of Mechanical Engineers or candidates holding appropriate equivalent qualifications.

Applicants for posts (b) and (c) should have had a sound general education and technical training and be well experienced in power station mechanical and electrical maintenance respectively.

Applicants for posts (d), (e) and (f) should have had technical training and practical experience in control and operation of steam generating plant and main switchgear.

Salary and conditions of service for all the above appointments, excepting (g), will be in accordance with the N.J.B. Schedule with superannuation under terms and conditions approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Divisional Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, and be returned within 14 days of this advertisement.

F. W. LAWTON,
Divisional Controller.
2128

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the position of CHEMIST at Portsmouth Generating Station.

Applicants should preferably be qualified analytical chemists with experience in either

(a) power station laboratory work; or
(b) water treatment in connection with high pressure steam plant and the testing of fuels and oils.

They should not be less than 25 years of age.

The salary will be in accordance with Grade 7, Class J of the National Joint Board's Schedule, at present £606—£633 per annum.

Forms of application may be obtained from the Divisional Secretary. The latest date for the return of forms is the 12th January, 1949.

P. D. A. OLIVER,
Divisional Secretary.
British Electricity House, High Street, Portsmouth.
21st December, 1948. 2254

BRITISH ELECTRICITY AUTHORITY

Southern Division

THERE are a number of vacancies for JUNIOR ENGINEERS in Generating Stations in the Southern Division.

The conditions of service are those approved by the National Joint Board for the Electricity Supply Industry and the commencing salary, which will vary with the size of station, will be in accordance with N.J.B. Grade 10, namely between £330 and £388 p.a.

Applicants should have had a sound general education and an apprenticeship or practical training suitable to the requirements of the Electricity Supply Industry. Preference will be given to candidates who are Graduate members of the Institution of Mechanical or Electrical Engineers or possess a University Degree or the High National Certificate.

The duties of the persons appointed will vary with each station, but will include as a general rule, the operation and control, under supervision, of turbo-alternators and boiler plant and applicants must be prepared to accept shift duties if called to do so.

The appointments will be superannuable under the Conditions of the Scheme of Regulations to be made under the provisions of the Electricity Act, 1947.

Additional generating stations are being built and new plant installed and in this expanding industry there are good chances of promotion for suitable candidates.

A form of application may be obtained from the Divisional Secretary and must be returned to the British Electricity House, High Street, Portsmouth, not later than 10 a.m., Saturday, 15th January, 1949.

P. D. A. OLIVER,
Divisional Secretary.
2253

BRITISH ELECTRICITY AUTHORITY
EAST MIDLANDS DIVISION

Overhead Linesman

APPLICATIONS are invited for the appointment of Overhead Linesman, experience of 132 kV lines essential. Conditions and wages in accordance with National Joint Industrial Council Schedule. Applications, stating age, experience, with copies of references, should be addressed to British Electricity Authority, East Midlands Division, Barker Gate, Nottingham.

This advertisement is published by permission of the Ministry of Labour and National Service under Control of Engagement Order, 1947. 2156

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for an appointment as BOILER HOUSE SUPERINTENDENT at Ocker Hill Generating Station, Class H, Grade 6, commencing salary £615 per annum.

Applicants must have received a thorough mechanical training and possess a wide experience in the efficient operation and maintenance of boiler house equipment in large generating stations. Preference will be given to Corporate Members of the Institution of Mechanical Engineers or candidates holding appropriate equivalent qualifications.

Salary and conditions of service will be in accordance with the N.J.B. agreement and superannuation under terms and conditions approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Divisional Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, and be returned within 14 days of this advertisement.

F. W. LAWTON,
Divisional Controller.
2257

BRITISH ELECTRICITY AUTHORITY

South Western Division

Shift Charge Engineer

APPLICATIONS are invited for the position of Shift Charge Engineer at Feeder Road Generating Station, Bristol. Salary and conditions in accordance with N.J.B. Schedule, Class H, Grade 8.

Applicants should have good technical qualifications and a sound knowledge of the operation and maintenance of generating plant.

The appointment will be subject to superannuation under terms and conditions to be approved by the British Electricity Authority.

Applications, stating age, qualifications and experience, should be addressed to the Generation Engineer (Operation), British Electricity Authority, South Western Division, Generating Station, Portishead, Bristol, to arrive not later than Saturday, the 8th January, 1949.

R. C. BARRETT, Divisional Secretary.
18th December, 1948. 2202

BRITISH ELECTRICITY AUTHORITY

APPLICATIONS are invited for the post of TRANSMISSION CONSTRUCTION ENGINEER at the Authority's Headquarters in London.

Candidates should have wide experience in the construction and maintenance of high-tension transmission lines, cables and sub-stations, and be capable of taking charge of this Department at Headquarters, which is involved in constructing extensions and additions to the Authority's main transmission system from the adoption of a scheme to the commissioning of the plant.

The salary range is £2,000 to £2,500 per annum, which is to be regarded as provisional until final scales have been negotiated with such organisations as are appropriate.

Applications, stating age, qualifications, experience and present salary, should be forwarded to the Director of Establishments (Applications Section), British Electricity House, Great Portland Street, London, W.1, not later than 8th January, 1949. 2198

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited from suitably qualified persons for the appointment of JUNIOR TECHNICAL ASSISTANT (Mechanical Engineer) on the Divisional Headquarters Construction Staff.

The salary offered is £500 per annum, this figure being provisional, and subject to negotiation through the appropriate National Joint Board.

The appointment will be superannuable under the conditions of the scheme to be or regulations made under the provisions of the Electricity Act, 1947.

Applicants should have a good knowledge of thermal dynamics and hydraulics and some experience of Power Station layout.

Forms of application may be obtained from the Divisional Secretary at the address below, to whom completed applications should be returned not later than 10th January, 1949, in sealed envelopes, endorsed "Junior Technical Assistant (Mechanical Engineer)."

H. V. PUGH, Divisional Controller.
168, Newport Road, Cardiff.
16th December, 1948. 2201

COUNTY BOROUGH OF SOUTHEND-ON-SEA EDUCATION COMMITTEE

Municipal College

Principal: R. W. Wilson, B.Sc.(Eng.), A.C.G.I., Whit. Sch., D.I.C., A.M.I.E.E.

Department of Science and Technology

APPLICATIONS are invited immediately for the post of RESPONSIBLE LECTURER FOR ELECTRICAL ENGINEERING.

Applicants must be graduate with teaching and/or industrial experience, and should offer Electrical Measurements and Instruments as a special subject for the Higher National Certificate course.

The salary will be in accordance with the Burnham Technical Scale, with an additional responsibility allowance of £80 per annum.

Application forms and further particulars of the post may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope. Application must be returned to the Principal within 2 weeks of the issue of this advertisement.

H. BOYES WATSON, Chief Education Officer.
Education Office, Warrior Square,
Southend-on-Sea.
14th December, 1948. 2203

CROWN AGENTS FOR THE COLONIES

APPLICATIONS from qualified candidates are invited for the following post:—

ASSISTANT ACCOUNTANT required by the Government of Nyasaland for the Public Works Department for one tour of two or three years, with the prospect ultimately of pensionable employment. Commencing salary according to age and experience in scale £550, rising to £865 a year. Free passages and liberal leave on full salary. Candidates, preferably between 24 and 30 years of age, must have had substantial experience in the Accounts Department of an Electricity Undertaking covering consumers' records and accounts, meter records, costing and statistics, and should be capable of implementing a costing and stores control system. The possession of a recognised accountancy qualification will be an advantage.

Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M/N/24301(30) on both letter and envelope. 2200

EASTERN ELECTRICITY BOARD

Northmet Sub-Area

Accountancy Assistant

APPLICATIONS are invited for the position of a Senior Assistant in the Accountant's Department of the Northmet Sub-Area.

Applicants must be qualified accountants and have had a wide experience of the accounts of electricity undertakings. Preference will be given to applicants who have had experience of Local Authority accounting.

The provisional salary will be £900 per annum, and the salary and conditions of employment will be in accordance with terms and conditions laid down from time to time by the properly constituted negotiating body.

Applications, stating age, qualifications and experience, details of present appointment and salary, previous appointments, and accompanied by the names of three referees, should be addressed in envelopes marked "Accountancy Assistant," to the Manager, Northmet Sub-Area, Northmet House, Southgate, N.14, to reach him not later than 14 days after publication of this advertisement. 2234

EASTERN ELECTRICITY BOARD

Northmet Sub-Area

Appointment of Assistant (Statistical) in Accountant's Department

APPLICATIONS are invited for the position of Assistant to the Section Head (Statistical) in the Accountant's Department at Sub-Area Headquarters.

Candidates must have had experience in the preparation of financial and other statistics.

The provisional salary for this appointment will be in accordance with the Interim Scheme Grade E, £600–£760, plus London weighting at a point dependent upon the applicant's qualifications and experience, and may be subject to further negotiation by the appropriate negotiating body.

Applications, stating age, qualifications and experience, details of present appointment and salary, previous appointments, and accompanied by the names of three referees, should be addressed in envelopes marked "Assistant" (Statistical), to the Manager, Northmet Sub-Area, Northmet House, Southgate, N.14, to reach him not later than 14 days after publication of this advertisement. 2233

SOUTH EASTERN ELECTRICITY BOARD

Staff Vacancy

APPLICATIONS are invited for the following appointment in the Tunbridge Wells District:—

MAINS FOREMAN. Rate 3/1½ per hour for 44-hour week in accordance with the scheduled rate for the Electricity Supply Industry. Applicants should have had sound training and experience in the laying, jointing and maintenance of 11 kV., 6.6 kV and l.t. cables and of a.c. supply networks. Experience of static transformer sub-stations would be an advantage.

Applications, stating age, present employment and experience, and giving names of two referees, should reach:—

The Manager,
Tunbridge Wells District,
South Eastern Electricity Board,
Town Hall,
Tunbridge Wells, Sussex.

by not later than the 15th January, 1949.

A. L. BURNELL,
Secretary.

10, Queen's Gardens, Hove, 3, Sussex.
December, 1948. 2256

DERBY TECHNICAL COLLEGE, NORMANTON ROAD DERBY

THE Governors invite applications for the post of Full-time LECTURER in Electrical Engineering. Applicants should possess a good Degree in Electrical Engineering of a British University and have had industrial experience; previous teaching experience is an advantage.

The successful candidate will be expected to take Electrical classes to Higher National Certificate Degree standard.

Salary will be in accordance with the Burnham Scale.

Full particulars of the appointment and a form of application, to be returned not later than 24th January, 1949, may be obtained from the undersigned.

W. ALFRED RICHARDSON, Principal.
2199

SOUTH WESTERN ELECTRICITY BOARD

Charge Engineers (Shift)

APPLICATIONS are invited for two Sub-Station CHARGE ENGINEERS (Shift) in the Bristol Sub-Area, with Headquarters at Bristol.

The commencing salary will be £398 per annum in Class H, Grade 9a. Salary and conditions of service will be in accordance with the N.J.B. Schedule and superannuation under terms and conditions approved by the British Electricity Authority.

Candidates should possess the Higher National Certificate in electrical engineering or similar qualifications, and previous experience in this type of work will be an advantage.

The duties involved will include the operation and supervision of routine maintenance of Sub-Stations with rotary and static plant.

Applications, stating age, experience and qualifications, to reach the Assistant Secretary (Establishments), S.W.E.B., Electricity House, Coiston Avenue, Bristol, 1, within 7 days of the publication of this notice.

South Western Electricity Board, Electricity House, Coiston Avenue, Bristol, 1. 2262

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:—

No. 5 Sub-Area

MAINS ENGINEER (Barnsley District)

Applicants should possess technical qualifications and have responsible experience in the design, construction, operation and maintenance of e.h.t. and l.t. underground and overhead systems, including sub-stations and their equipment.

Provisional salary in accordance with the N.J.B. Schedule Class F, Grade 3—£687—£715 per annum.

Applications stating age, qualifications, experience, present position and salary, together with the names of two persons to whom reference may be made, should be forwarded to the Manager, No. 5 Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than fourteen days from the publication of this advertisement. 20th December, 1948. 2255

A LEADING C.M.A. manufacturer with expanding commercial interests has a vacancy in London for a cable sales and estimating clerk. Applicant must be experienced in rubber and plastic insulated electric wires and cables, and capable of working on his own initiative.—Write, stating age, full details of experience and salary required, etc., to Box 2245.

A NUMBER of vacancies exist in Midlands for single young men of O.N.C. Elec. Engineering standard, with at least 3 years' electrical workshop experience, to be trained as draughtsmen on switchgear. Young draughtsmen also welcomed for special training on switchgear.—Apply, quoting ref. D.O.28, to Box 2045.

A WELL-ESTABLISHED and expanding London export firm specialising in electrical and mechanical plant, machinery and stores, invites applications for the position of a technical sales manager. A sound and fairly comprehensive technical knowledge is essential, commercial experience desirable. Experience in boilers, turbo alternators, diesel engines would be specially useful. Please write, giving full details of training and experience, also age and salary required, to: Box 2229.

AN assistant electrical engineer is required for a large industrial undertaking in the London area. Candidates should have a sound technical training, with considerable experience in the installation of electrical requirements on a large scale. They should be capable of planning extensions, drawing up specifications, preparation of estimates progressing new work and generally supervising contractors engaged on sub-stations; EHT, HT and LT, cabling, lighting and telephones, etc. He will work under the senior electrical engineer. The post is permanent and progressive, there is a non-contributory pension scheme, and five-day week. Salary about £500, but commensurate with qualifications and experience. All replies, stating age, education, qualifications, experience, Service history, should be addressed to the undermentioned box number, quoting E/JKH.CE on the envelope. Replies will only be sent to applicants who are called for interview.—Box 2236.

AN electrical engineering company in the Midlands requires Draughtsmen experienced in mechanical design and in construction of a.c. and d.c. machines.—Reply full particulars of experience and training to Box No. 473, T. & G., 101, St. Martin's Lane, London, W.C.2. 104

ARMATURE and Stator Winder for small progressive business, one conversant with all classes a.c. and d.c. work, able to work on own initiative.—J. Bateson, Ltd., Gibraltar Works, Parkinson Lane, Halifax. 8871

ASSISTANT Engineer for London office of large Electrical Manufacturing Company, conversant with the heavy power plant market in overseas territories. To be Chartered Electrical Engineer with connections in London export houses. Age 30-40. Salary up to £700 according to qualifications.—Write Box 493, T. & G., 101, St. Martin's Lane, London, W.C.2. 1904

ASSISTANT engineer, age 35-40, for service on Gold Coast. Good education and thorough technical training with workshop experience. Knowledge of I.C. engines, installation and maintenance, electrical generation, and distribution equipment and general repairs, mining machinery essential. Experience ropeways, conveyors and motor vehicles desirable. Salary about £750 per annum. Adequate leave and kit allowance. Appointment subject to agreement renewable annually.—Write in first instance giving details age, training and experience to Box 3962, c/o Whites, Ltd., 72-78, Fleet St., London, E.C.4. 2209

BARNET firm require young draughtsman age 22-25 for illustration of technical service manuals. State age and salary required.—Box 2206.

CHIEF draughtsman with experience in electrical instruments and test equipment design. Excellent prospects for man with suitable experience.—Box 2212.

CONTRACTS engineers for electrical switchgear required. Higher National Certificate or equivalent, and previous experience. Permanent. Houses available to suitable applicants.—Apply Personnel Superintendent, The English Electric Co., Ltd., Stafford. 2099

CONTRACTORS, estimator or assistant for South Manchester. State experience and salary required.—Box 106.

DESIGN engineer for instrument transformer design by Midlands firm of repute. H.N.C. standard and marked interest in electro-magnetic design.—Send details and salary required, quoting Ref. 179, to Box 2105.

DESIGNER draughtsman junior, age between 22/28 with some experience in design of decorative and commercial electric light fittings, for London office. Progressive position for man with initiative and originality.—Please write stating age, training, experience and salary required, to Box 2259.

DRAKE & GORHAM have a vacancy for a cost clerk, male or female, for preparing accounts. 5-day week.—Apply to Secretary, 36, Grosvenor Gardens, S.W.1. 2235

DRAUGHTSMAN, junior, required with experience of transformer manufacture, good prospects.—App.y, stating age, experience and salary, to Brentford Transformers, Ltd., Kidbrooke, London, S.E.3. 2179

DRAUGHTSMAN required, good prospects with reputable concern London, for young draughtsman with technical training and possessing initiative and some design ability. Experience with light precision mechanical equipment and good grade sheet metal work desirable. Some electrical knowledge an advantage. State age, experience, technical training and salary required.—Box 2013.

DRAUGHTSMAN with sound technical knowledge and experience of Low Tension Metalclad Switchgear for old-established Switchgear Manufacturer's Works in N.W. London. Permanent position and good prospects for the right man. Full details of experience and salary required, etc., to Box 2047.

DRAUGHTSMEN. Applications are invited from draughtsmen experienced in any of the following branches of engineering:—layout of power station boiler plant, turbo-alternator plant, feed heating systems and auxiliaries, pipework systems, boiler feed pumps and ancillary apparatus; layout of boiler and propelling machinery for battleships, cruisers, or large steamships; layout of power station electrical equipment, main switchgear, auxiliary switchgear, main auxiliary cabling and ancillary work; design and layout of steam and steam/electric heating systems and thermal storage systems for large industrial buildings. Applicants, in addition to having drawing office experience, will be expected to be capable of assisting in the site supervision of construction work. Applications are also invited from architectural draughtsmen experienced in detailing working drawings for large industrial buildings. The location of work is in the East London area, and in view of housing difficulties, applications are particularly invited from unmarried engineers. The salary will be generous and in accordance with qualifications, age and experience. Applications, by letter only, should be addressed to:—John Bruce & Partners, Consulting Engineers, Brunswick Wharf, East India Dock, London, E.14. 2242

DRAUGHTSMEN required by switchgear engineers. Experienced in contract work, protective gear diagrams or design. Applications in writing, with full particulars, to—Ferguson, Pailin, Ltd., Manchester, 11. 86

E. K. COLE, Ltd., require technical representative for car radio division. Previous experience of car radio installations essential.—Ekco Works, Southend-on-Sea. 2239

E. K. COLE, Ltd., require car radio sales representative. Applicants with experience of motor industry and knowledge of radio technique preferred.—Ekco Works, Southend-on-Sea. 2239

ELECTRICAL engineer, experienced in the design and specification for manufacture of small electrical machinery and apparatus. Applicant should have degree or equivalent qualification. S.E. London. —Apply, giving experience and salary required, to Box 8882.

ELECTRICAL engineer as assistant to managing director of electrical contractors in London, South Wales, and Hull. Experience layout, estimating industrial power and lighting, with a view to expansion of business. Excellent opportunity for an ambitious and capable man.—Full particulars to—Box 2210.

ELECTRICAL manufacturers, Central London office, require sales correspondence/order clerk, similar experience essential, age 30 years approximately.—Full details and salary required to Box 2207.

ELECTRICAL engineer, experienced industrial and domestic installations, contracting architects, etc., estimating and supervising, to take charge of old-established electrical engineer contracting dept., S.W. London, with a view to increasing and improving same. Would consider future partnership to right man.—Write stating qualifications, salary required, etc., Box 8836.

ELECTRICAL Engineers and Contractors, Midland Area, require fully skilled estimator, also junior estimator. Experience in Ministry of Works contracts preferred. State wage required.—Box 2046.

ELECTRICAL Engineering. Men required for training on sales/contract work. Must possess Higher National Certificate in Electrical Engineering, and be of good appearance and address. This is a first-class opportunity for the right type of men. State age, experience and present position.—Box 2049.

ELECTRICAL transformer designer by Midland manufacturer with practical experience of construction and design, up to 500 kVA. State experience and salary required.—Box 2103

ELECTRICAL wholesalers require clerical assistant in stores office. Must have a good knowledge of electrical material.—London Electrical Co., 92, Blackfriars Rd., S.E.1. 2261

ELECTRICIANS by London contractor, used to Ministry contracts and general installation work. State experience.—Box 8869

ELECTRICIANS with general contractors' experience. Permanent positions offered to good men.—Ive, 29, Clarendon Rd., Watford. 59

ENERGETIC man as senior production control clerk having had previous experience in a similar capacity. £300 to £350 p.a.—Box 2260.

ENGINEER, experienced in electrical switchgear, to co-ordinate and plan work of contracts department. Thorough knowledge of all classes of heavy switchgear. Permanent. House available to suitable applicant. Apply Personnel Superintendent, The English Electric Co. Ltd., Stafford. 2100

ENGINEER, preferably qualified for consulting engineers for power, lighting and heating installations; sound technical knowledge with drawing office experience, ability to handle correspondence, prepare specifications; good progressive open ng offered; state age, experience, salary required; London district.—Box 2244.

ENGINEER with experience in design of industrial switchboard instruments. Excellent position and prospects for man with suitable qualifications.—Write giving full particulars of experience and salary required to Box 2213.

ENGINEERS for switchgear department of large firm in Midlands. University degree men to whom electrical power schemes and their associated mathematics will be no trouble should send full details and salary required, quoting Ref. 180, to: Box 2104.

ESTIMATING Engineer, age 25-35, London contractors, able to take full charge of contracts at all stages; permanent position; state salary required.—Box 2180.

EXPERIENCED draughtsmen required immediately. Small fuse and switchgear or cable accessories. Machine tool design. Overhead electrical fittings. Permanent positions, with superannuation scheme, salary according to age and qualifications.—Apply in writing, giving details of age and experience to Staff Officer, B.I.C.C., Ltd., Prescot, Lancs. 2214

GENERAL clerk, female, with knowledge of typing for office in London (Victoria). Experience of electrical wholesale trade an advantage. 5-day week.—Write stating age, experience, salary required, etc., Box 8851.

IMPORTANT non-E.L.M.A. manufacturer requires first-class representative for lighting fittings in London and Home Counties. Applicants must be of good appearance, tenacious and able to introduce new business. Previous experience desirable, but not essential. Own car an advantage. Basic salary, Commission and expenses.—Send fullest details Box 102, Dorland Advtg., Ltd., 18-20, Regent St., London, S.W.1.

JUNIOR electrical designer of medium and large rotating machines required, age 23 to 25 years (ex-service men up to 30 years). Applicants shou'd have University degree in electrical engineering, or equivalent, with sound knowledge of mathematics, and good practical training, preferably with drawing office and/or test experience.—State age, qualifications, experience, and salary expected, to Manager, Rotating Plant Dept., Bruce Peebles & Co., Ltd., East Pilton, Edinburgh. 2205

JUNIOR Estimator by well known London contractors, suit young charge hand with technical knowledge or other suitable experience.—Box 2181.

LARGE electrical manufacturing co. situated in North East London requires senior transformer draughtsman for checking. Experience on large power transformers essential. Good salary and prospects for man with necessary qualifications.—Box 2009.

LEADING electrical organization requires additional representatives for London and Home Counties territories. Applicants need not necessarily have previous electrical experience since a short period of training is given during which full salary and expenses are paid. Applicants should be under 30 years of age, and remuneration will be by salary and commission.—Write giving full details which will be treated with confidence. —Box 2208.

MANAGER, age 35-45, preferably with electrical or civil engineering training, to take charge of and develop established business dealing with the impregnation treatment of wood poles in Great Britain and the Dominions; this appointment offers an interesting and lucrative position with an assured future to the right man; essential requirements: sound administrative experience, organising ability, good personality, able to meet senior executives and capable of controlling staff; considerable travel will be involved, and some connections with electricity authority engineers, railways and G.P.O. would be an advantage; commencing salary approx. £1,200 p.a. —State age, experience, training and when available, to Box 2135.

ORDER clerk by London electrical wholesaler; similar experience necessary; salary required, etc., to: Box 2243.

PLANNING Engineer by manufacturers of small electro-mechanical control devices; West London area; age 23-28; applicants must have drawing office experience and be conversant with batch production methods, motion study and design of assembly jigs and fixtures; Higher National Certificate in Mechanical Engineering essential.—Box 2139.

POWER cable engineers for laboratories and engineering department of large engineering works in the London area. Engineering degree or equivalent. Salary according to age and experience.—Write stating age, qualifications and salary required to Box 2241.

RADIO and television engineer by old-established electrical and radio contractors.—Ive, 29 Clarendon Rd., Watford. 92

RADIO/Television service engineers, also testers, inspectors, wiremen, senior, electronic, radio, radar, television research/development engineers (preference B.Sc., H.N.C.), and draughtsmen; technical representatives, acoustic products (provinces); radio salesman, working foreman electrician, electric ans and storekeeper; rate fixer (radio), lady tracers, armature winders (male).—Technical Employment Agency 179, Clapham Rd., S.W.9 (Brixton 3487). 8874

REPS. or agents required by manufacturers of candle and tubular type lamps for Lancs, Yorks, Scotland and S. Wales.—Reply in first instance, stating salary or commission required, Box 2131.

REPRESENTATIVE by well-known manufacturers. Must have car and established connection in Yorkshire and North-East Coast, amongst the larger purchasers of decorative and industrial electric light fittings. Progressive position for keen and energetic man with proved sales record.—Write stating age, education, training, experience, salary required, and present turnover, to Box 2257.

REPRESENTATIVE by well-known manufacturers. Must have car and established connection in London amongst recognised wholesalers and decorative and industrial electric light fittings. Progressive position for keen and energetic man with proved sales record.—Write stating age, education, training, experience, salary required, and present turnover, to Box 2258.

REPRESENTATIVE for South Wales area by well-known national wholesaler. Applicants must have had experience in this area and should be familiar with the wide range of material handled by wholesalers. Applications, giving full details, will be treated in strictest confidence.—Box 172.

REPRESENTATIVE for the Newcastle area, on salary, commission and expenses, by Elexcel, Ltd., manufacturers of "Xcel" electric cookers and domestic electric appliances. Applications, which will be treated in strictest confidence, should state experience and connections in the sale of such equipment, which is important. Also give full details of qualifications, and whether possessing car.—Elexcel, Ltd., 49, Wigmore St., W.1. 41

REPRESENTATIVE for established electrical wholesalers, London area. Must have knowledge of materials handled.—Write in first instance, giving details of experience, etc., to Ivers, Ganton House, Ganton St., London, W.1 (quoting Ref. A.G.W.G.). 2211

REPRESENTATIVE for S.W. London and Surrey by prominent electrical wholesalers. Good connections with supply companies, contractors and retailers will be handed over to the right man, who will be supported by an energetic organisation with a complete range of merchandise. Applications are therefore invited from keen and experienced men (car owners) wishing to earn a substantial income on salary, commission and expenses basis.—Write fully to Box 177.

REPRESENTATIVES with established connections among industrial buyers and electrical contractors for N.W. and South London territories by well-known E.W.F. wholesaler; own car an advantage; remuneration by salary, commission and expenses. Write fully, in confidence, giving present turnover, income and area covered.—Box 1896.

SALES engineer required in London office to prepare estimates and quotations for h.v. and l.v. switchgear.—Write stating age, experience, salary, etc., to Box 2012

SALES Representative required by electrical wholesalers, to take over existing accounts on the South Coast (Portsmouth Area); previous experience and local residence essential.—London Electrical Co., 92, Blackfriars Rd., S.E.1. 2133

SALESMAN for London showrooms of high-class lighting fittings makers. State age, experience.—Box 8881.

SENIOR and junior draughtsmen with the following experience (a) mechanical and electrical, light engineering and mechanisms of a precision nature; (b) electronic devices, amplifiers and radar. Education to Higher National Certificate or equivalent.—Apply with full particulars of experience, qualifications, age, etc., to Box A.C. 35802, Samson Clarks, 57-61, Mortimer St., W.1. 2204

SENIOR Contract Draughtsmen urgently required. Must be fully expd. in the layout of H.V. and heavy metal-clad switchgear, including wiring diagrams and detail work. Salary commensurate with ability. Write, giving full details of experience and age, to—Personnel Manager, Cooke & Ferguson, Ltd., Openshaw, Manchester 11. 2176

SENIOR Draughtsman required. Experienced in lighting and power layouts, main switchgearing and automatic control circuits. Applicants must be under 45 years of age.—Apply Industrial Relations Dept., Kodak, Ltd., The Works, Wealdstone. 109

SHORTHAND typist, between 29 and 40, willing accept responsibility, required by electrical engineer in Grand Buildings, Strand. State age, experience and salary required.—Box 8873.

TECHNICAL assistant in electrical department of large works in North of England. Applications giving age, details of education, experience, positions held (with dates) and including photograph, should be submitted, together with salary required to—Box 1985.

TECHNICAL assistant for Hong Kong, preferably with commercial experience. A.M.I.E.E. or A.M.I.M.E. Airmail full particulars and photograph.—China Engineers Ltd., P.O. Box 148, Hong Kong. 2008

TECHNICAL electrical estimating engineer required in Shrewsbury; some knowledge of switchgear and similar design an advantage. Please send details of experience and salary required to.—Hartley Electromotives, Ltd., 17, St. John's Hill, Shrewsbury, attention —Technical Manager. 2079

TELECOMMUNICATIONS engineer, age 30 to 40 with degree and having experience in line transmission and equipment required by cable manufacturer in Eastern area. Good prospects, salary and pension fund. —Box 2005

TRANSFORMER sales engineers required in large manufacturing company in Midlands. Sound practical experience on power and distribution transformers. Some sales experience an advantage. One senior and two juniors. Send details and salary required, quoting Ref. 175, to Box 2044.

WORKS Manager for factory in North-West England producing a large output of medium and heavy electrical apparatus; applicants must be thoroughly experienced in modern workshop practice; preference given to an Engineer with academic qualifications; applicants should give full details of training, experience and salary required.—Box 2136.

YOUNG Engineer for compiling data in transformer test office of a large electrical manufacturing company situated in North London; experience of power transformer testing essential; write, stating details of experience, also age and salary required.—Box 2134.

CLASSIFIED ADVERTISEMENTS ARE PREPAID

SITUATIONS WANTED

ADVERTISER (age 36) at present holding executive position with large electrical combine (14 years) desires change. He is looking for a post which will enable him to give full scope to his flare for solving production and development problems. Possesses technical qualifications and is a good organiser. Birmingham area, salary £1,050.—Box 8865.

A.M.I.E.E. (31), full works apprenticeship, seeks technical sales post. Works and sales experience motors (esp. a.c. commutator) and control gear. Also knowledge of installation work and electronics.—Box 8866.

CHARTERED electrical engineer, 33, seeks responsible, well-paid post where initiative and hard work recognised. Wide technical and commercial experience. Power supply, plant, cables, lighting, etc.—Box 8863.

COMPANY director, 30 years of age, seeks an appointment such as assistant managing director in a progressive company with a view to further advancement. Engineer, with intimate and practical knowledge of all aspects of industrial administration and factory organisation. Present salary £1,500 per annum.—Box 8867.

ELECTRICAL engineer, experience industrial domestic layouts; factory maintenance; underground, overhead; specifications; estimates; go anywhere.—Box 8845.

ELECTRICAL foreman, 38, versatile knowledge of heavy and light plant installations and maintenance, desires change. London area.—Box 8849.

ENGLISHMAN on leave desires change. Present with large British electrical concern in India as manager. Would consider similar offer India, Pakistan, New Zealand or East. Alternatively represent manufacturers. Only firms of high repute need apply.—Box 8880.

GRAD. I.E.E., 26, works, commercial and design experience of light electrical engineering and electronics, seeks progressive situation.—Box 8884.

LINESMAN (35), 17 years' experience, returned from abroad, seeks position with contracting firm, prepared take charge and travel.—Box 8847.

RESEARCH engineer, fully qualified, with successful record in field of industrial electronics including motor speed control seeks responsible position in progressive concern in Southern England.—Box 8854.

AUCTION NOTICES

ELEVENTH SALE G. R. WITHOUT RESERVE
BY ORDER OF THE MINISTER OF SUPPLY.
R.A.F. No. 25 MAINTENANCE UNIT, HARTLEBURY, WORCESTERSHIRE
4 MILES FROM KIDDERMINSTER,
11 MILES FROM WORCESTER
NOCK & JOSELAND
are instructed to sell by Auction (without reserve) at the above unit on
FRIDAY, 14th JANUARY, 1949, at 11 a.m.
A large quantity of valuable miscellaneous stores including:—
Electrical Equipment includes 2 Transformers (B.T.H.) 100 kvA. 22 portable petrol driven generating sets. Electric sewing machines. Accumulators and Batteries. Small generators and numerous spares.
Wireless equipment includes 300 receivers. A large quantity of Condensers and miscellaneous spares.
General Stores include 72 Petrol Driven Balloon Winches. Trailers on pneumatics. 1,750 Box Kites. 2½ tons of aluminium sheets. Dinghies Pulley Blocks and chains. 3 ton Mobile weighing machine. 100 rolls of ordnance wrap. Engineers and Carpenters tools. Aircraft cushions. Webbing equipment. Mess tins and water bottles. 1,500 China Egg cups. Aircraft wheels and hubs. Small aircraft tyres. 500,000 Clay Pigeons, etc.
Photographic equipment includes 52 Cameras Gun type. A large quantity of Sodium Metabisulphite. Pyro Metol Developer. Paper. Bromide. etc.
12,000 pairs Shoes Black R.A.F. pattern. 800 pairs Boots ankle and Quantity of Miscellaneous Clothing.
2,000 Coils of Cordage various sizes.
1,100 Balloons and Valises type KB Mark VI and a large quantity of Balloon stabilisers. 4,500 Supply dropping units.
7,000 Small Mattresses (Biscuit type). 5,000 Brown hessian sheets, 8ft×6ft. 3,000 Ground sheets.
On view—Thursday 13th January, 1949 between the hours of 10 a.m. and 4 p.m. and on the morning of the Sale Day between the hours of 9 a.m. and 11 a.m.
Catalogues—PRICE SIXPENCE each (POSTAL ORDER NOT STAMPS)
are obtainable from the Auctioneers:—
NOCK & JOSELAND, Bank Buildings, Kidderminster. (Tel. 2053)
2263

BY Order of the Ministry of Supply. Fourteenth Sale. G B
16. MAINTENANCE UNIT, STAFFORD,
adjoining the main Sandon Rd., 2 miles from the centre of Stafford.
SOUTH & STUBBS
are instructed to sell by auction on
WEDNESDAY, 12th JANUARY, 1949,
at 11 o'clock prompt,
on No. 1 Site, 16, Maintenance Unit, Stafford, a large quantity of
R.A.F. SURPLUS EQUIPMENT AND STORES,
including: Receivers, type R1355 and BC 966 AZ; converter units; lead acid accumulators 2v; amplifier units and power units; 5-way junction boxes; magnetos; aircraft starter motors; various sockets and switches; fusing units; navigation lamps and spares; indicator units; superchargers; cathode-ray tube indicator units; drop tanks; fighter type dinghies; qnt. of kite cord; various cables; lead-covered, etc.; hydraulic jacks with stands; qty. of ladders; caterpillar trailers, 3ton and 5ton.
PHOTOGRAPHIC EQUIPMENT, etc.
Quantity of bromide paper, glossy normal, contrasty and soft; Sashalite Photoflash bulbs; photographic plates; developing tanks, daylight and spool type; contact printers; various photographic chemicals, including: Pyro-Metol developer, sodium hypo. developer, glacial acetic acid and developer for cine film. Approx. 300 pairs of VARIOUS BINOCULARS.
On view: Tuesday, 11th January, from 10 to 4 o'clock, and morning of sale from 9 o'clock.
Catalogues 6d each (postal orders only—stamps not acceptable), admit two to view and sale, from the auctioneers
Auctioneers' Offices: Bank Passage, Stafford (Tel. 82). 2215

IMPORTANT sale of precision instruments and machine tools. Oliver, Kitchen & Flynn, in conjunction with Harry Ward & Son, will sell by auction on Monday to Wednesday 17th, 18th and 19th January, 1949, commencing each day at 10.30 a.m., at 27, New Station St. (off Boar Lane), Leeds, 1, approx. 1,060 lots of valuable precision instruments, machine tools, etc., brand new and unused, viz.: Precision instruments, 3in precision lathes, electric motors, machine tools, machine and electrical equipment, drills, milling cutters, etc., etc. All well-known makes, unused and mainly in original packings. On view: Wednesday to Friday, 12th, 13th and 14th January, 1949, from 10 a.m. to 4 p.m. each day. Catalogues (3d each) available from the joint auctioneers.—Oliver, Kitchen & Flynn, 30, Albion Place, Leeds, 1, or Harry Ward & Son, 27, New Station St., Leeds, 1. 2216

FOR SALE

Traders buying and selling hereunder must observe the Restriction of Resale Order, S. R. & O 1942 No. 958.

A B. & W. water tube boiler will cut down your fuel costs; we can supply from stock. Two 25,000lb evap., 250lb w.p. One 20,000lb evap., 175lb w.p. Two 16,000lb evap., 190lb w.p. Two 12,000lb evap., 200lb w.p. We install complete, including brickwork, also turbo alternators, 6,000 kw.—Burford, Taylor & Co., Ltd., Boiler Specialists, Commercial St., Middlesbrough. Tel. Middlesbrough 2622. 32

A COOKSLEY & Co., Ltd., Tabernacle St., E.C.2. Monarch 3357, offer: New slip ring motors, 400/3/50, ex stock; 6-7½hp 1,425rpm English electric with starters, £84 each; 3-10hp 1,425rpm English electric with starters, £89/10 each. Modern, reconditioned, slip ring motors: 1-30hp 400/3/50, by Howell, slip ring, 1,500rpm, ball bearing, side ventilated, with Howell oil-immersed stator rotor starter, hand operated, £125; 1-17½hp 356/3/50, by English Construction Co., ball bearing, slip ring, ventilated with oil-immersed hand-operated stator rotor starter by Allen West, £75; also squirrel cage motors, 1hp to 25hp, in stock, new and second-hand. 2226

A Cooksley & Co., Ltd.; a.c. and d.c. Motors, Portable fans. Switchgear, etc.—21-25, Tabernacle St., London, E.C.2. Tel. Mon. 3357-8-9. 46

A C. and d.c. house service meters, all sizes, quarterly and prepayment, reconditioned, guaranteed one year. Repairs and recalibrations.—The Victa Electrical Co., 47, Battersea High St., S.W.11. Tel. Battersea 0780. 138

A .C. B.T.H. Metrovick motors, ¼hp, 200/250v, 50c. 1-ph., 1,425 rpm, new, £5/9/6 (capacitor start £6/14/6); ½hp, £6/12/9; ½hp, £11/0/6; also 3-phase and d.c. Guaranteed repairs and rewinds.—Johnson Engineering, 319, Kennington Rd., S.E.11. Reliance 1412-3. 99

A C. and d.c. motors, all sizes, large stocks, fully guaranteed.—Milo Engineering Works, Milo Rd., East Dulwich, S.E.22. Forest Hill 2278-9. 102

A .C. and d.c. motors, generators from stock.—Service Electric Co., Ltd., Water Rd., Alperton, Middx. Perivale 7251-2-3. 91

A .C. and d.c. motors, large stocks, fully guaranteed. —Lyton Electric Co., 7, Picton Place, W.1. Welbeck 8096. 154

A .C. motors; choice of 400 motors always available at reasonable prices.—Call or write, Clydesdale Works, John Phillips & Co. (Electrics), Ltd., 32, Park Rd. North, S. Acton, W.3. A.E.M.T. guarantee. Acorn 6011. 224

A 100 kW Newton generator, 110 volts d.c., direct-coupled to a 150hp B.T.H. slipring motor, 400 volts, 3 phase.—G. Waterman, Ltd., 330, Purley Way, Croydon, Surrey. 2142

ALTERNATING current motors: 3 phase, 50 cycle, 400 volts, screen protected type slipring: 1 80hp 725rpm Mather and Platt; 1 60hp 580rpm B.T.H.; 1 25hp 705rpm, B.T.H.; 1 10hp 570rpm Lancashire Dynamo; 1 with oil immersed control gear. Screen protected type, squirrel cage: 2 25hp 970rpm Brook; 1 16hp 710rpm B.T.H.; 1 15hp 950rpm Brook; all with oil immersed Star Delta starters; 1 1hp 710rpm Higgs with direct-on starter. Pipe ventilated: 10hp 570rpm M. & P. slipring with rotor starter; 7½hp 1,450rpm M. & P. s.c. with Star Delta starter.—Furse, 20, Mount St., Manchester. 2 2112

APPROXIMATELY 300 yards heavy duty electrical cable, suitable for carrying 30-50kw. First reasonable offer. Sample sent on request.—317, Regents Park Rd., N 3. Finchley 5143. 139

AUTOMATIC Kohler sets, 110, 220V 800 watts to 10kW sizes; dynamos 110 and 230V, 2 to 200 kW. a.c. motors, 400/3/50, sizes 1 to 350hp. Steam and diesel sets. a.c. and d.c., 4 to 500 kW. Panels, etc.—E. Binns, 156a, Falsgrave Rd., Scarborough. 8376

BA. screws, nuts, washers, tags, eyelets, rivets, wood screws, huge stocks; your requirements, one gross upwards, promptly supplied; export enquiries welcomed. —P.R.S., 33, Bourne Gardens, London, E.4. Tel. Clisold 4688. 8830

BATTERY chargers, 4 models, 2-6-12v, 1-2-4amps, d.c., any mains voltage; also larger types, special transformers, chokes, test gear, interior car heaters, etc. —The Banner Electric Co., Ltd., Hoddesdon, Herts. 97

BATTERY charging plant. Westinghouse rectifiers, type 400/3/50, complete with 3 points charging board, output 6 and 12 amps. Price £25 each.—Lipton Products, Ltd., Lower Glory Mill, Wooburn Green, Bucks. Tel. Bourne End 680. 2021

BRITISH Electric Co. (Beco), Ltd., can give quick delivery for all types of rewinds up to 300hp. First-class guaranteed work.—25-9, Lower Rd., Rotherhithe, S.E.16. Tel. Bermondsey 3449. 65

CABLE, new, 1,000yds C.M.A., 1 sq in (19/.083) 660v 4 core, paper lead S.T. armd. and served, 750yd C.M.A. .2 sq in (37/.083) 660v 4 core paper lead D.S.T. Armd. and served.—Box 2166.

CABLE.—10,000 (500ft) coils of single 16 gauge V.I.R. cable, flame retarding, packed in cases, each coil packed in cartons. Bargain, 10/6 per coil, minimum 100 coil lots.—Lipton Products, Ltd., Lower Glory Mill, Wooburn Green, Bucks. Tel. Bourne End 680. 2023

CANDLE lamps, British made, guaranteed, all voltages, 25-40 watts, all caps, olive and twisted. Export enquiries welcomed. State requirements.—Thos. Handley & Co., Ltd., Britannia House, 74, Wellington St., Leeds. 175

CHANGE pole squirrel cage motors, 3/2-1½hp, speed 1,450, 970, 720, 460 rpm, 400v, 3-ph, 50 cyc; two-speed flange mounting squirrel cage motors, 2hp at 1,425 rpm, 1hp at 705 rmp, 400/440/3/50, 2hp and 1hp flange mounting squirrel cage motors; speeds 2,850, 1,425, 945 rpm.—Box 56.

COPPER wires, enamelled, S.C.C., D.C.C., E. & S.S.C., D.S.C., P.C.E., Litz, 8swg-47swg; your requirements, 1oz-1 ton, immediately supplied; export enquiries welcomed.—P.R.S., 33, Bourne Gardens, London, E.4. Tel. Clisso'd 4688. 8831

CROMPTON-PARKINSON 1,500amp, 10volt plating generator with 1.75amp, 240volt Exciter, direct coupled to 27hp motor, 715rpm, 38amps, suitable for 400/3/50 supply. Mounted on common baseplate, complete with field regulators and starter for motor. Crompton-Parkinson 250/300amp, 20/40volt plating generator, with circuit breaker and rotor starter, direct coupled to 40hp motor, 960rpm, for 400/3/50 supply. Hockley 300amp, 6volt plating generator coupled to 4hp motor, 1,425rmp, for 400/3/50 supply. We also have a Langbeirn Pfanhauser plating generator, 250amps, 8volts, and a Canning's plating generator, 500amps, 12volts, which can be supplied with a suitable motor if required.—Cox & Danks, Ltd., Plant & Machinery Dept., Langley Green, Oldbury, Birmingham. Tel. Broadwell 2011. 2219

DC. moters, 400 volts, Crompton 45hp and 50hp, 1,000 rpm, brand new, complete with starters, etc. At list price from stock.—Pattern Parts, Ltd., 508, Holloway Rd., London, N.7. 8840

DELIVERY immediate! Grubb immersion heaters in standard voltages, 1, 2, 3 and 4kw loading, 12in to 42in, with or without thermostats. Enquiries invited from wholesalers and exporters. For full details and trade list write to Hardman & Co., Ltd., The Baum, Rochdale, Lancs, or Tel. Rochdale 4151 (4 lines) 57

DIESEL generating sets, English manufacture, 3-phase, all sizes from 50kw to 260kw.—Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. 157

DIESEL alternating sets, 100, 180 and 300kva, 400/3/50, G.M. engines direct coupled to redesigned English alternators, radiator cooled, complete with electric starting gear, fuel tanks, instrument panel, all mounted on common baseplate. Prompt delivery. Other sizes and voltages available.—Lovat Engineering & Supply Co., Ltd., 16, Rood Lane, London, E.C.3. Man. 3838. 2142

DIESEL generating sets, brand new and guaranteed, all sizes, e.g., 68kva, £1,830; 25kva, £850; 5.6kva, £270.—Box 93.

DIESEL Generating Sets, English manufacture, direct current, all voltages, from 50 kW to 260 kW.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 158

DIESEL set by Allen & Sons, Bedford, 100hp, 500rpm direct diesel engine coupled to 60kw 220volt d.c. generator with control gear.—Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. 2109

ECONOMISER greens 40 gilled tubes in two banks, arranged 5 tubes wide × 4 high × 9ft long, H.V. single, working pressures 250lb, complete with safety valve, soot blowers, dampers, etc., all in good condition, seen London.—Box 2167.

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ELECTRIC Furnace for heat treatment, 400 v., 28 kW, 3-phase, 50 cycles, by Siemens-Schuckert, unused, can be viewed England.—J. Parker, St. Peter's Power House, Jersey, C.I. 84

ELECTRIC Motors, Dynamos, Alternators and Motor Generator Sets of all sizes. We hold one of the largest stocks in England. New and reconditioned with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 13

ELECTRIC Motors, a.c., 3-phase, single-phase, and d.c. Motors: Electric Motor-driven Pumps and Blowers; 1 Allen West, 5hp, slipring, 400/440-v., 3-ph. Starter, and single-phase, direct-on Starters, Switchgear and Fuseboards; 2 210-v., 300-amp. D.P. P.E.C. Circuit Breakers; 1 B.T.H. 3-phase Oil Circuit Breaker; 1 British Federal Electric Flash Butt Welder, 100 kVA, 50 cycles, 400 v.; 1 Metrop. Vickers Flash Butt Welder, 60 kVA, 400-440 v., 1-phase; 2 Birmingham Electric Furnaces, 25 kW, 400 v., 3-phase, 50 cycles, 1 zone, temp. range 0-700° C.; 1 Birlec Cassel Carboneutral Furnace, 40 kW, 420 v., 3-phase, 50 cycles, 1 zone, temp. 0-1,400° C., complete with transformer and control panel; 1 Birlec 40-kW, 400 v., 3-ph., 50 cycles, 1 zone, temp. 0-1,000° C., complete with transformer and control panel; 4 Keith Blackman Blower Exhausters, type 30, 400 v., 20 amps., 15hp, 2,900 r.p.m.; 4 do., type S.4, 400 v., 11 amps., 8hp, 2,900 r.p.m.; 1 Vickers Rotary Converter, 200 kVA, 220-150 v., 50 cycles, 750 r.p.m., 6-phase complete with starting panel; 1 Lucas Twin Chambered Hardening Furnace, 6ft×3ft×9ft, with air unit; 1 Wild Barfield H.M.3 Furnace, electric, 3ft×5ft×6ft; 2 Oil Feed H.T. Furnaces, with motor-driven blowing fan, 10ft×10ft×10ft; 1 Birlec Type V.F.C.2018 Furnace, 4ft dia., 6ft high; 1 Brayshaw Oil-fired Furnace, 8ft×6ft×10ft; 1 Oil-fired Salt Bath, 4ft×4ft×3ft; 4 Oil S.1 Furnaces, 1ft×8in×10in.—C. J. Rice, 137, Mayplace Road West, Bexleyheath, Kent. Bexleyheath 3282. 55

ELECTRIC Motors, a.c. and d.c. We supply all types and sizes of electrical machinery, motorised slow speed reduction gears built to customers' specific requirements. Short deliveries.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Rd., London, N.W.10. Colindale 4821/2. 42

ELECTRIC Motors, ⅓hp, 3,000 r.p.m., d.c., 110 volts. Also 220 volts, £6 each.—John E. R. Steel, Dept. 39 Bingley, Yorks. 51

ELECTRIC Welding Plant, Engine and Electric, a.c. driven, 300 amps output, complete with weather-proof covers.—Applications to Box 244.

FIVE a.c. to d.c. Ward Leonard sets available, comprising 105hp input motor, 400/440/3/50, 1,470rpm, 124amps, direct coupled to 250-volt d.c. generator, 1,470rpm 255amps, on fabricated steel base, with separate variable speed driving motor, 75/45hp, 250/150v d.c., 860/510rpm, with control panel; makers, Metropolitan-Vickers; ref. 3217.—May be inspected at: Cox & Danks, Ltd., Plant & Machinery Dept., Faggs Rd., Feltham, Middx. Tel. Feltham 3471. 2114

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FLUORESCENT Fittings by Croftlite, from 10 watts to 80 watts, including all new tube wattages. Competitive prices; first-class sales service; 12 months' guarantee; generous discounts. Specialised service for electrical contractors. Write to—Croftlite, Ltd., 15, Goodge Place, Goodge St., London, W.1. Tel. Museum 9941. 247

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FLUORESCENT Lighting Units, 22 models in 2/3/4/5ft. metal and Perspex. Send for lists. Large stocks of Tapped Silent Ballast, Switches, Holders, Shells, etc.—Moss Brothers, 112/114, Deptford High St., S.E.8. (Tideway 2623) and 53, Goodge St., W.1. Museum 5385. 12

FOR Export: 5amp 3-pin, 15amp 3-pin Switch Plugs; 5amp 3-pin, 15amp 3-pin Plug Tops. Holders, Switches, etc., etc. Send us your enquiries.—L. Benn & Co., Ltd., 81, City Rd., London, E.C.1. Tel. Clerkenwell 5546. 164

FRACTIONAL H.P. Motors, new, ex-stock, a.c., d.c., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony.—Jeary Electrical Co., Ltd., 5, Lamb's Buildings, E.C.1. 246

FRACTIONAL H.P. Motors. New fractional hp electric motors available ex-stock. Brief specification: Single-phase 50 cycles, 4-pole, capacitor type, screen protected, ball-bearing induction motors, compete with capacitor condenser. Rated to develop output 110/120 v., 1/32hp, 1,390 r.p.m.; 200/240 v., 1/30th hp, 1,400 r.p.m. Full specification for home and export.—Civitas Trading Corporation Ltd., 10, Portman St., London, W.1. Tel. Regent 1213; Grams, "Civitas, Wesdo, London." 62

FRACTIONAL horse-power Motors; ¼, ⅓ and ½hp, available from stock. Send for free illustrated catalogue.—Horseshoe Supply Co. (Spalding) Ltd., Spalding, Lincs. 48

FREQUENCY Meters, 7in dial, by Everett Edgcumbe and Record Elect. Co., etc., Government surplus, as new, £10 each, carriage paid. Quantity enquiries invited.—J. Parker, St. Peter's Power House, Jersey, C.I. 85

FROM stock: Ekco Ballast Units; Hi-Craft Starter Gear; Ekco Starter Switches; Hi-Craft Switches; Ekco Switch Sockets; Duralite 4ft Tubes; Fluorescent Fittings, 4ft and 5ft, complete with tubes.—Winter Trading Co., Ltd., 6, Harrow Rd., Paddington, London, W.2. Tel. Paddington 3271. 108

GEARED Motors and Reduction Units built to customers' requirements, all voltages, new, quick delivery.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Rd., London, N.W.9. Colindale 4821/2. 213

G.E.C. 5hp 400/440v 3 ph. 50c motor, B/B, 2,850 rpm; £21/10, ex-stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 2231

GENERATING Sets, petrol engine-driven alternators, 220/240 volts, single-phase and 3-phase. Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. 160

GENERATING sets, petrol, 5 to 15 kVA, single phase, 50 periods, 230 volts.—Midland Counties Elec. Eng. Co., Ltd., Grice St., West Bromwich. 43

GENERATING sets. 55 11kVA 230/400 volt 3-phase and neutral 50 cycle alternators by E.E.C., .8 power factor, 1,500 rpm, cont. rated. Complete with separate exciters, switchboards and automatic voltage regulators. Could be supplied direct coupled to diesel engines as self-contained units.—F. W. Langley, Ltd., Clough St., Hanley, Stoke-on-Trent. 1937

GENERATORS, 7.5kW, 110v. d.c., new and unused, 1,750 r.p.m., £69.—Benmotors Power Supplies, Summerley St., Earlsfield, S.W.18. Wim. 3833. 150

GENERATORS.—Two 18kW 110 volt d.c., powered by Ford V.8 engine, with switchboard, and mounted on a two-wheel trailer. 200 kW, 230 volt d.c. generating set direct coupled to twin G.M. diesel engines, and mounted on bed plates. Voltage regulator, 24 volt electric starter. Ready for immediate delivery.—Lipton Products, Ltd., Lower Glory Mill, Wooburn Green, Bucks. Tel. Bourne End 680. 2022

G.M. Diesel engines, type 6-71, RC 165hp. A.E.C. diesel engines, type A/190 131hp; complete with radiators, fans, oil coolers, gearboxes, fuel tanks, starters, and dynamos. Condition, as new (approx. 100 hours running); £280.—G. R. Mole, Bros., Clows Top, Kidderminster. 237

G.M. diesel sets, 50kw, 400/440/3/50 a.c.; also 220v d.c.—Fyfe, Wilson & Co., Ltd., Bishop's Stortford. 2252

GENERATING Sets, petrol engine-driven dynamos, 110 volts and 220/240 volts direct current.—Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. 159

HI-CRAFT 4ft Fluorescent Fittings, complete with built-in control gear and tubes, £3/5/7; also Miniature B.C. coloured lamps and Holders, Switchgear, Govt. surplus, etc. Send 1d. stamp for lists.—Northern Industries, Snow Hill, Manchester, 4. 135

HOME or Export. Considerable quantities of Electric Motors, Generating Units, Oil Engines, etc., available.—British Engineering Products, 33, Hornton St., Kensington, W.8. Wes. 6855-6932. 196

HOUSE meters, 200-240v, a.c., s-ph, 50c; price 17/6, plus 1/- carriage.—Universal Electrical, 221, City Rd., London, E.C.1. 129

IMMEDIATE delivery, new 110kw d.c. generating set comprising Paxman Mark 6 RPH diesel engine direct coupled to 110kw 440/220v 3-wire d.c. generator, complete with radiator and electric starting, set assembled on mild steel underbed with mild steel canopy and side curtains, complete with switchgear for separate floor mounting.—For full specification apply to Box 2168.

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INSTANT start Ballasts and control gear for the new Instant Start tubes, now available. Orders in strict rotation. Trade only.—Elmech, Ltd., Broadheath, Cheshire. 8785

LADDERS, steps, trestles from—Ramsay & Sons (Forfar), Ltd., Forfar. Tel 172. 45

LEAD-covered telephone cables, all sizes, immediate delivery.—Box 2084.

LESLIE Dixon & Co. for dynamos, motors, switchgear, chargers, telephones, etc.—214, Queenstown Rd., Battersea, S.W.8. Tel. Macaulay 2159. 18

MOTOR generator sets and converters, all sizes and voltages from ½kW up to 500kW in stock.—Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, City Rd., London, N.1. Tel. Clerkenwell 5512, 5513 & 5514. 28

MOTOR 5hp 400v, 3-phase, squirrel cage; never been used.—Box 2264.

NAMEPLATES, engraving, diesinking, stencils.—Stillwell & Sons, Ltd., 153, Far Gosford St., Coventry. 14

NEW and unused single phase a.c. generators, 9kva, 0.8 p.f.; 50 cycles, 230v, 39.2amps, 1,500 revs. Complete with exciters, Isenthall automatic voltage regulators, and switchboard with ammeters, voltmeters, reversing switches and voltage controllers, covered by Coventry Climax petrol driven engines, radiator and fan cooled, with water pump additional cooling, governor controlled R.A.C. rating 15hp, 51 B.H.P. at 2,500 r.p.m. Mounted on steel framed chassis, direct coupled and with approx. 25-gall. petrol tanks.—Commercial Structures, Ltd., Plant Division, Argall Works, Argall Ave., Leyton, London, E.10. 2015

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NEW Turner-G.E.C. Diesel alternating sets, 7½kW, 230-1-50, with switchgear; new Pelapone-Mawdsley, 20kVA, 400-230-3-50, 4-wire Diesel alternating sets, 1,000 r.p.m., with switchboard; ditto, 27½kVA Diesel generating set, marine type, 5kW, 110volt, d.c. Russell Newbery R.D. engine, 1,000 r.p.m., McClure compound wound, drip-proof, interpole generator, reconditioned.—Thoka Machinery Supplies, Ltd., King William St. House, E.C.4. Tel. Man. 4130. 30

ONE 45kVA self-contained diesel engine driven generating set on combined baseplate, incorporating a 56hp Crossley vertical diesel engine, speed 1,000 rpm, direct coupled to 45°VA alternator by the English Electric Co., 400 volts 3-phase 50 cycles 4-wire supply, with switchgear and all accessories. One 31 kVA diesel engine driven generating set, incorporating a 37hp vertical 6-cyl Cummins engine, speed 1,000rpm, direct coupled to a 31kVA alternator by Westinghouse for 400 volts 3-phase 50 cycles 4-wire supply, with switchboard and all accessories. (Can also offer these mobile on 4 pneumatic-tyred wheels.) One 25kVA diesel engine driven generating set, comprising a vertical 4-cyl cold starting Lister diesel engine, speed 1,000rpm, direct coupled to a 25 kVA alternator by Met. Vickers for 400 volts 3-phase 50 cycles 4-wire supply, with switchboard and all accessories. One 15 kVA diesel engine driven generating set, comprising a vertical 3-cyl cold starting diesel engine by Lister, 1,000rpm, direct coupled to a 15 kVA Maudsley alternator for 230 volts single-phase 50 cycles supply, with switchboard and all engine accessories.—George Cohen Sons & Co., Ltd., Wood Lane, London, W.12 (Tel. Shepherd's Bush 2070), and Stanningley, nr. Leeds (Tel. Pudsey 2241). 2230

ONE Crompton Parkinson new 30kW 2-wire d.c. generator, compound, giving off a full output 460 and 500v, at 1,200 rpm, complete with slide rails, etc. Can be seen by appointment.—Write Box F109, c/o Streets, 110, Old Broad St., E.C.2. 2286

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P.I.L.C.S.W.A. power cables, 1, 2, 3 and 4 core, ex-stock. Also dynamo starter and V.I.R. cables, all new and unused but under makers' price.—Box 2085.

P.I.L.C. Served, Armoured and Unarmoured, .01 to .5 sq in, in stock and for very early delivery; also V.I.R., T.B.C., single-core, up to 1 sq in section, 660 v; Heavy Cab Tyre Trailing Cables, .06 sq in per core, ¾" o/d and smaller stock.—The Cable & Electrical Supply Co., 28, Wimbledon Park Rd., Southsea, Hants. Phone, Portsmouth 31730. 37

PLATING Dynamos, new, 800 amps., 6 volts, 400 amps., 6 volts, with d.c. or a.c. motors or new petrol engines.—Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. 156

PLATING Dynamos, 1,600 amps., 10 volts, with d.c. or a.c. motors.—Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. 155

PLATING Generators, unused, several ranging from 350 to 1,800 amps., 6 to 12 volt, plain or with a.c. or d.c. motor drive.—Particulars from—Stewart Thomson & Sons (Liverpool) Ltd., Fort Rd., Seaforth, Liverpool, 21 (Bootle 2697); or Dacre House, Victoria St., London, S.W.1 (Abbey 4017 & 4835). 63

PLATING motor generator, 120kw in stock, comprising Crompton Parkinson 185hp slip ring motor, 5ph 50c 400v, direct coupled to d.c. generator 0-60v, 3,000amp, with direct coupled exciter, on cast-iron bed, with Allen West starter.—Thomas Mitchell & Sons, Ltd., Bolton. 2165

POLISHING spindles. Double ended 3in ball bearings with 2ft 6in extension shafts, suitable for internal and external work. 400 volt 3 phase motor at bottom of 3ft high stand. Allen West starter and automatic brakes. Price £25 each.—Lipton Products, Ltd., Lower Glory Mill, Wooburn Green, Bucks. Tel. Bourne End 680. 2020

POWER Winches, approx. 10 cwt., driven by 12-v geared motor, ideal universal unit, £9 10s.—Benmotors Power Supplies, Summerley St., Earlsfield, S.W.18. Wim. 3833. 153

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ROTARY Converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Rd., London, E.C.1. 16

ROTARY Converters, 220 v d.c. to 230/1/50 a.c., 3 kVa, £39; 5 kVa, £49.—Benmotors, Power Supplies, Summerley St., Earlsfield, S.W.18. Wim. 3833. 151

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SLIP-ring Starters and d.c. Starters up to 40hp, short deliveries, all voltages.—Electropower Co., Ltd., Kingsbury Works, Kingsbury Rd., London, N.W.9. Colindale 4621-2. 204

SLOTMETERS (Prepayment Meters), a.c. and d.c., all kinds and sizes supplied. Billiards Switches.—Brent Electrical Co., 6, Holmdale Gardens, London, N.W.4. 130

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STARTERS, Slipring and d.c., hand operated, all voltages up to 40hp, new. Short delivery. Also Push-button and Star-Delta, 380/440/3/50, ex-stock.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Rd. London, N.W.9 Colindale 4621-2 212

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SUPERIOR Type Builders' Ladders now in production; also Steps, Trestles and extension Ladders. Tel. Shaftesbury Ladders, Ltd., 453, Katherine Rd., E.7. Grangewood 3363-4. 15

STOCKS of brass for disposal. 30 tons dead soft bending quality extruded brass strip, ⅝in×3/32in×6ft long. 6 tons 15 cwts dead soft bending quality extruded brass strip, ⅝in×⅛in×12ft long. 5 tons 2 cwts rolled dead soft bending quality extruded brass strip, ⅜in×⅛in. in 50/60lb coils. 3 tons 18cwts screwing quality brass tube, 2in×10 gauge, 10-15ft random lengths. 1 ton 13 cwts screwing quality brass tube, 2in×1⅛in. 7 tons 4 cwts ¾in diameter turning quality brass rod, 10-12ft random lengths. Stocks of lamp shade fittings for disposal: 10 reams lampshade vellum in sheets 24in×56in. 65,000 cut and punched vellums. 1,000 gross yds trimming cord. 50,000 lampshade frames, 4½in o.d. with pendant. 20,000 lampshade frames, 12in o.d. with pendant. 30,000 lampshade frames, 12in o.d. plain. Stocks of electrical components for disposal: 9,500 small plastic-hand.ed screwdrivers. 50,000 yds maroon flex, 14/0076. 700 ½in screwed b.c. bakelite lampholders, "Nettle" brand. 10,000 ½in screwed b.c. bakelite switch lampholders, "Nettle" brand. 10,000 b.c. bakelite adaptors, "Nettle" brand.—Enquiries to Box 2267.

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TRANSFORMERS, 5 kVA, 115/230/1/50, new and unused, ex-Govt., £19/10.—Benmotors Power Supplies, Summerley St., Earlsfield, S.W.18. Wim. 3835. 152

TUBULAR Heaters, 3ft. 5ft. 7ft and 10ft sizes available. Attractive discounts. Write for list.—T-B Productions, The Malt House, Weedon, Northants. 61

TWO rotary convertors, ball bearing, protected type, input 500v d.c., output 225/1/50, 20amps, or 440v d.c. output 200/1/50, 18amps, with transformer primary tapping 160v, secondary 220v hand operated Igranic starter; ref. 2543.—Cox & Danks, Ltd., Plant & Machinery Dept., Faggs Rd., Feltham, Middlesex. Tel. Feltham 3471. 2115

TWO unused 6/12 volt motor generator plating sets, 1 English Electric Co., 550 amp, coupled to a.c. 400/3/50 motor, starter and voltage regulator.—Electric Machinery Co., Union St., Ancoats, M/cr. Collyhurst 1352. 2140

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ZF Fluorescent Starter Switches are available in 6 models at list prices from 3/4 to 5/10 each, and will suit any make of fitting. Our trade and wholesale discounts are the highest in the industry.—Zodiac Electrical Products, Springfield Rd., Guiseley, Leeds. 233

2 3in electric centrifugal pumps. 36in electric hydro extractor. 20hp motor, 415/3/50, 920 rpm. 20kW semi-diesel set, 220 volts, d.c. 20hp diesel locomotive, 24in gauge. 90 kW Belliss 220 volts steam generating set. 5kW Lister diesel set, 220 volts.—Harry H. Gardam & Co., Ltd., Staines. 60

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5-kVA Diesel Alternating Set, Ruston Hornsby/Brush Alternator, 230-1-50, direct drive, mounted on M.S. bed, with A.V.C. switchboard.—Berry Hill Plant Division, Cheadle, Staffs. Tel. Cheadle 2181 & 2261. 175

9-kVA new Switchboards, 230 v, 1-phase, with instruments, switches and regulators; also Isenthal Automatic Voltage Regulators.—Midland Counties Electrical Eng. Co., Ltd., Grice St., West Bromwich. 169

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100. 50, 30 and 20-kVA, 400/230-v. Diesel Engine-driven Generating Sets. Immediate delivery. The Horseshoe Supply Co. (Spalding), Ltd., Horseshoe Rd., Spalding. Tel. 2535. 49

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250-kW Rotary Converters (2), with transformers and switchgear, input 6,600 volts, 3-phase, 50 cyc.es, output 420/210 volts; also a.c. and d.c. Motors, Switchgear, Generating Sets, Welders, etc.—Midland Counties Electrical Engineering Co., Ltd., Grice St., Spon Lane, West Bromwich. 36

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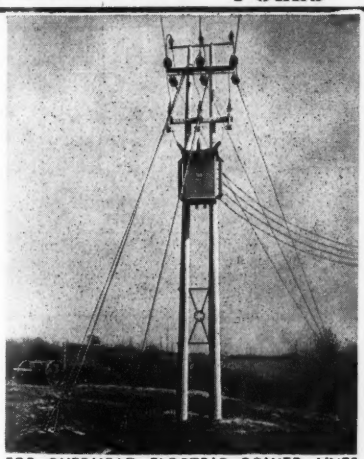

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10	7½	1440	Crompton Parkinson
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11	5	950	Crompton Parkinson
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1	5	950	Brook
6	5	1430	Crompton Parkinson
19	5	1430	Metro-Vickers
9	4	1000	Brush
5	3	940	Crompton Parkinson
9	3	1000	Brush
4	3	950	Metro-Vickers
1	3	1430	Crompton Parkinson
28	3	1430	Metro-Vickers
8	3	1430	Crompton Parkinson
3	3	1430	Brook
3	3	1440	Brush
1	2	750	Brush
4	2	950	Metro-Vickers
10	2	1000	Brush
4	2	1425	Metro-Vickers
16	2	1430	Crompton Parkinson
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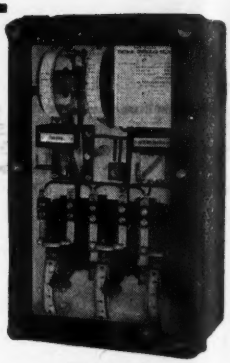

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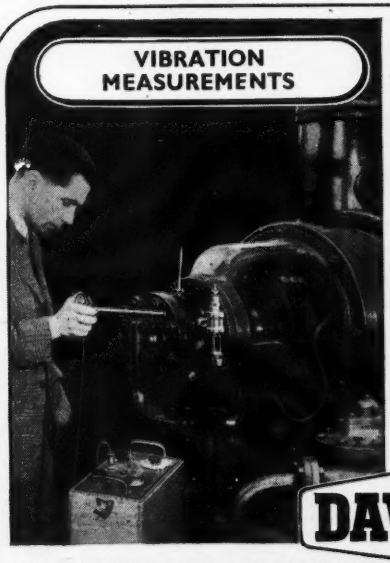

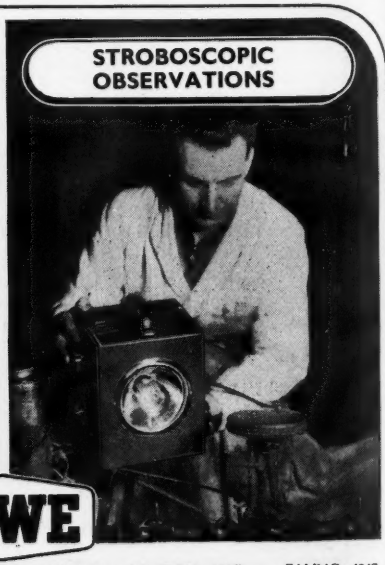

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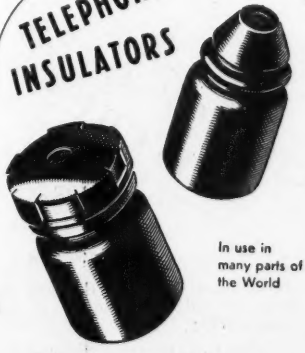

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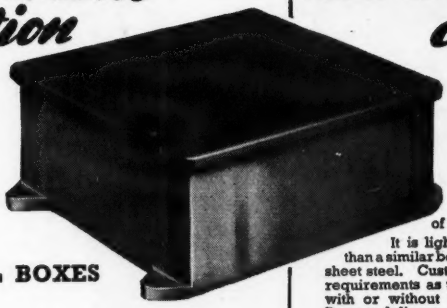

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35 Amps.
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Water Heaters
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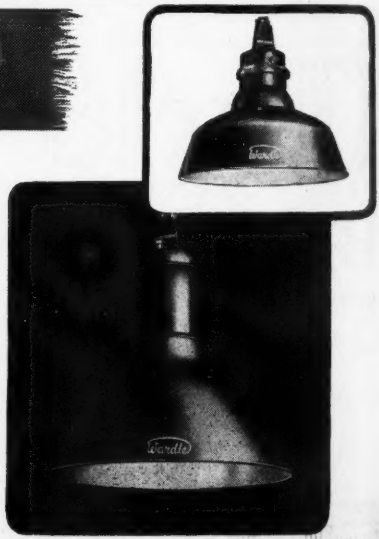

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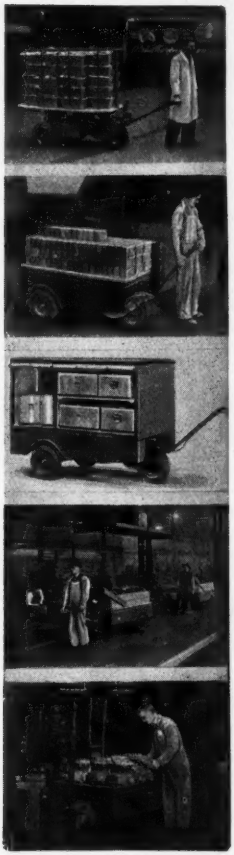

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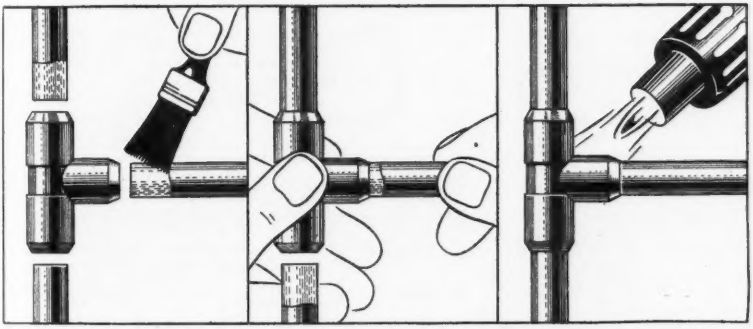

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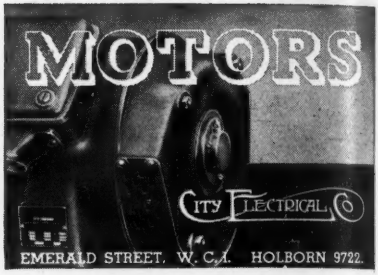

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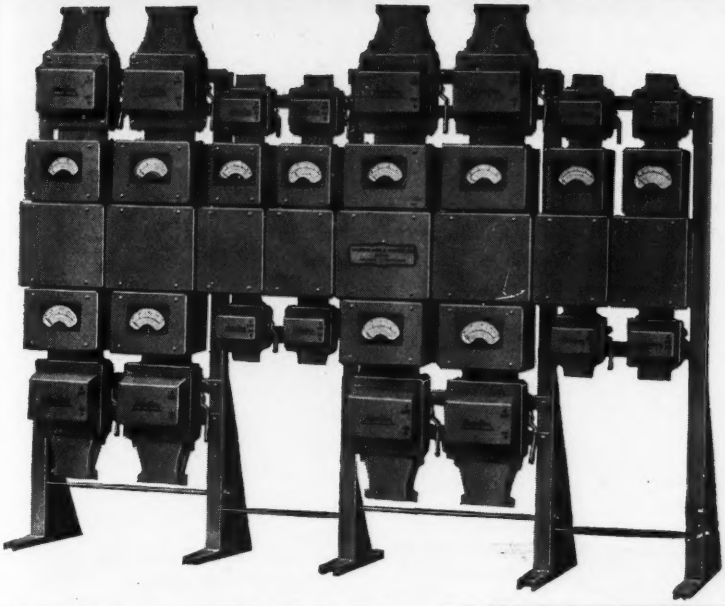
UNIT TYPE SWITCHBOARDS



This system provides separate busbar unit chambers which are fabricated from pressed steel parts and cadmium plated for rust-proof finish.
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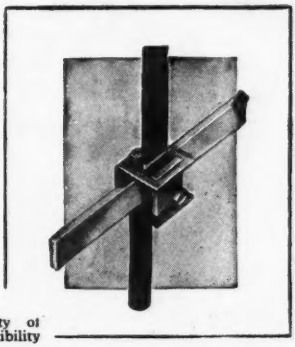
Connections either of copper bar or cable are made to the busbar by clamps.

See descriptive brochure reference UB-46-1



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Although written primarily for Kathanode Battery users, this little booklet on Battery Maintenance contains a wealth of information invaluable to all operators of electric vehicles and, it is hoped, will prove of considerable assistance in maintaining efficiency and reducing running costs.

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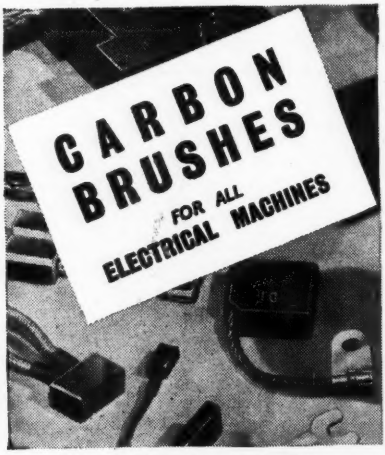

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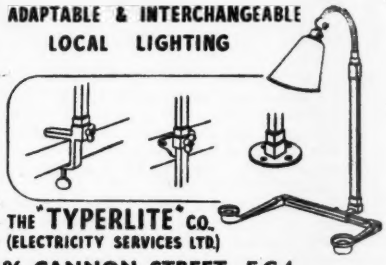

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INDUSTRIAL ELECTRIC HEATERS AND RESISTANCE UNITS

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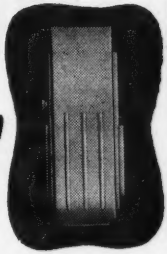

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For this elegant device;
It lets me out of answering bells
And making room trips twice.
Instructions now are phoned to me
And answered 'on the dot';
For which step-saving serv'ice—
Thanks, Mister, thanks a lot

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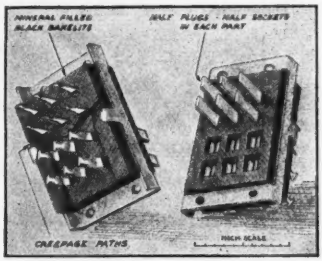

FEATURES INCLUDE

- Robust, mineral filled black bakelite mouldings.
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- Non-reversibility.
- Half plugs — half sockets in each part.
- Silver plated contacts.
- Mild steel flange.
- Supplied in 4, 8, 12 and 18-way contact assemblies.
- The depth behind panel $\frac{25}{64}$"

List No. 1 part only	Flat Contact	Overall size of flange	Working voltage Pin to Pin 1500 v. Pin to Flange 2250 v.
L 610	4-way	$1\frac{19}{32}" \times \frac{3}{8}"$	
L 611	8-way	$1\frac{47}{64}" \times \frac{53}{64}"$	
L 612	12-way	$1\frac{21}{32}" \times 1"$	
L 613	18-way	$2\frac{3}{16}" \times 1"$	

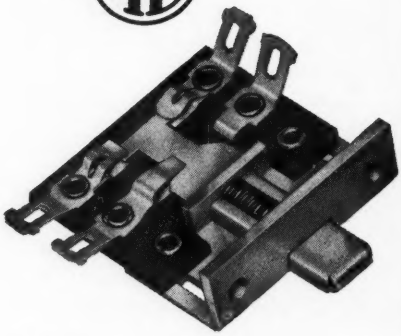
Prices and samples on application.

BELLING & LEE LTD

CAMBRIDGE ARTERIAL ROAD ENFIELD, MIDDX

A New Switch

by AB



TYPE DSI

Originally designed for lid or door operation in the "personal" type of portable radio set, these compact spring action switches may be used for many other purposes, such as for switching door or window operated warning bells, interior cabinet lighting, etc.

The maximum switching combination is double-pole, single throw with common moving pole at frame potential. Alternative switching arrangements can be developed to customer's requirement.

Our range includes "OAK" wafer switches, single or multi-bank, toggle switches, push-pull switches, rotary switches. We can also produce prototypes to your own specification. We should be happy to send you our illustrated catalogue.

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SWITCH MAKERS WITH A LONG RECORD OF VERSATILE SERVICE TO THE ELECTRICAL AND RADIO INDUSTRIES.

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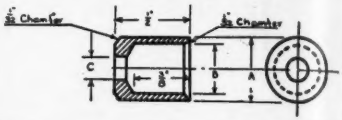

SIZE	A		B		C	
	inch	mm.	inch	mm.	inch	mm.
1	.275"	6.97	3/16"	4.76	3/32"	2.38
2	.354"	9.00	1/4"	6.35	9/64"	3.57
3	.406"	10 30	5/16"	7.94	9/64"	3.57

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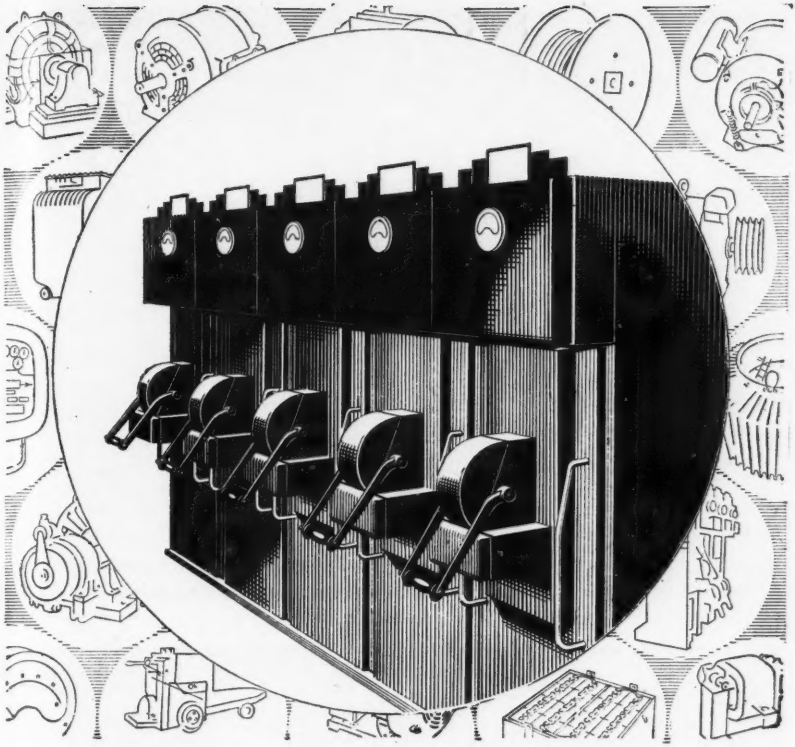

5 INTO 4 WILL GO WITH ALA 1 SWITCHGEAR

When you want to put a 5 unit board where there seems to be room for only 4 units, find out about Crompton ALA 1 switchgear. Each unit requires approximately 40 cu. ft. less space than a normal metal clad unit of the same rating. This ALA 1 switchgear is exceptionally rigid in construction and is type tested to B.S.S. 116—1937. Performance certificates have been issued by the Association of Short-Circuit Testing Authorities of which Crompton Parkinson Limited are members.

Ratings—600 amps up to 150 MVA at 6.6 kV and 11 kV, 3 phase and 250 MVA, 11 kV, 3 phase. Circuit breakers for hand, solenoid or spring closing.

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LIMITED

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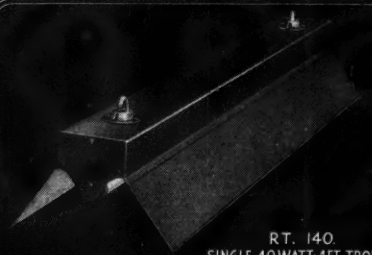

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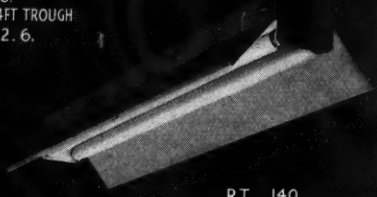

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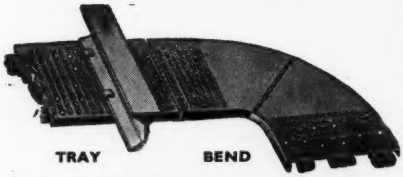

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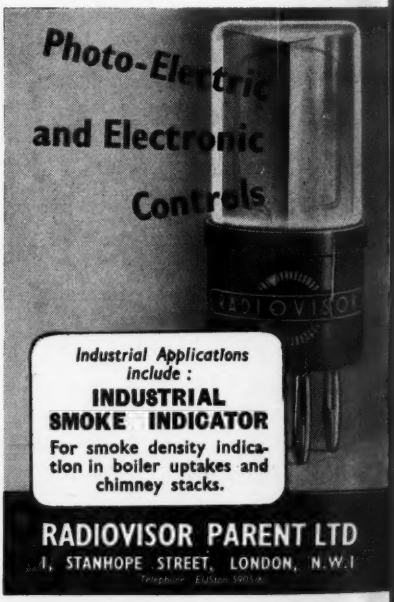

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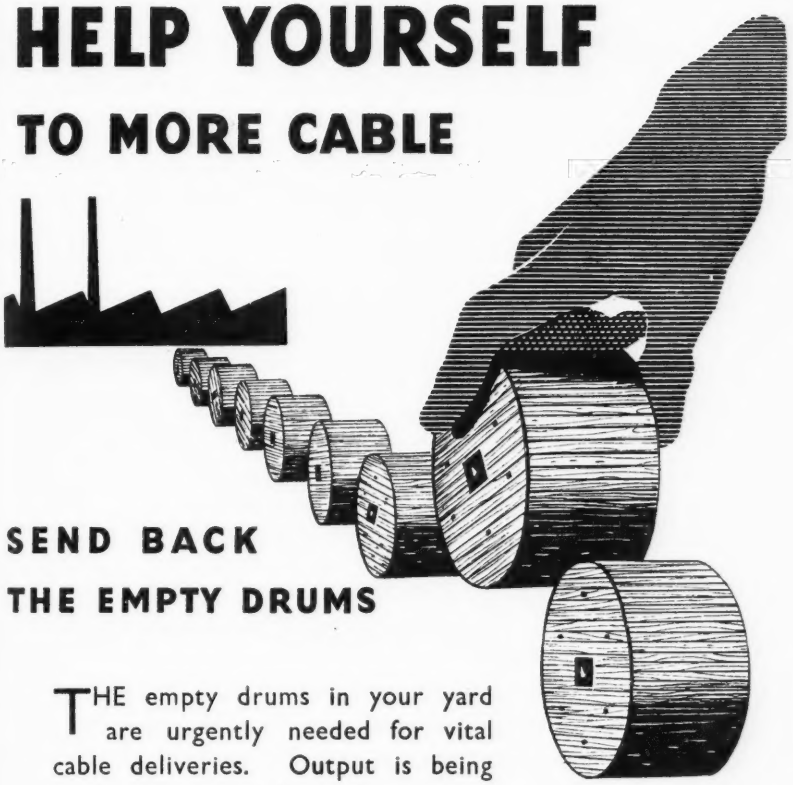

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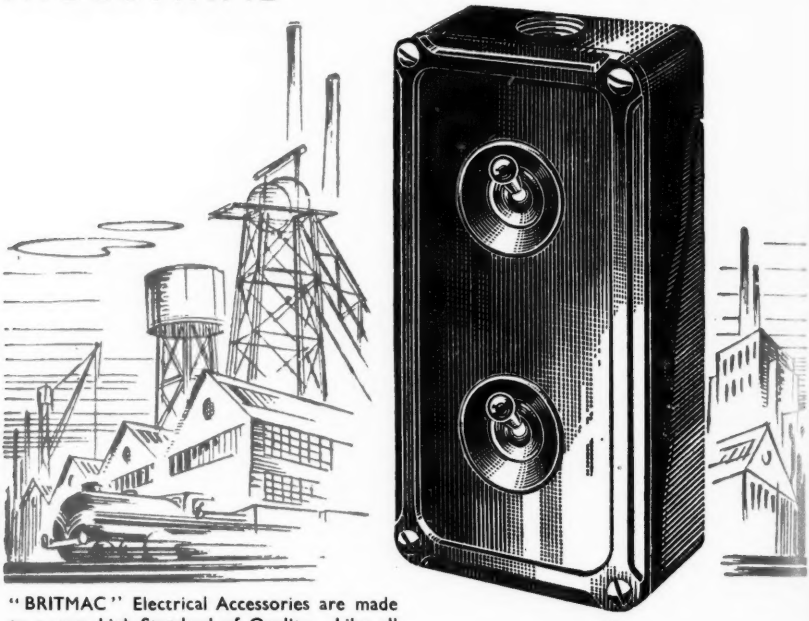

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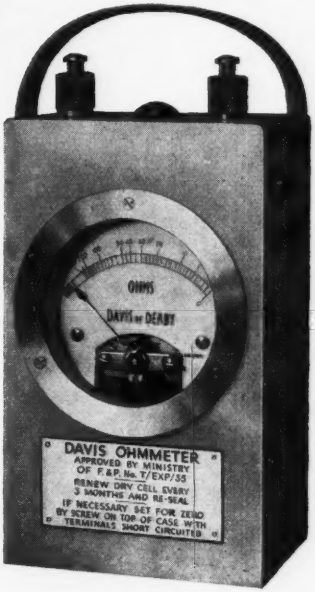
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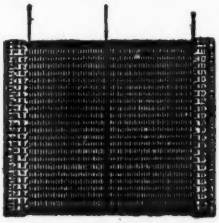

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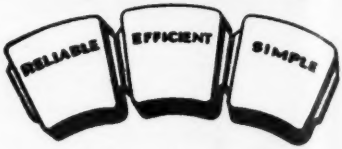

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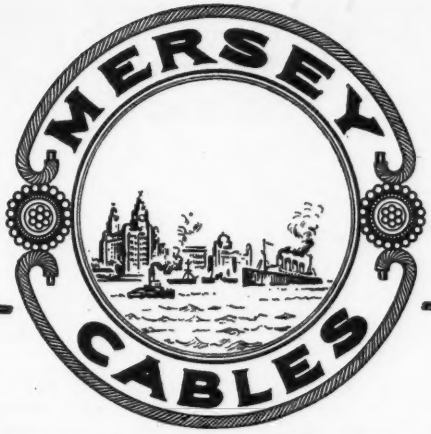

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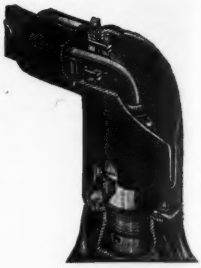

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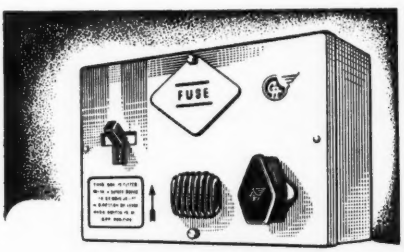

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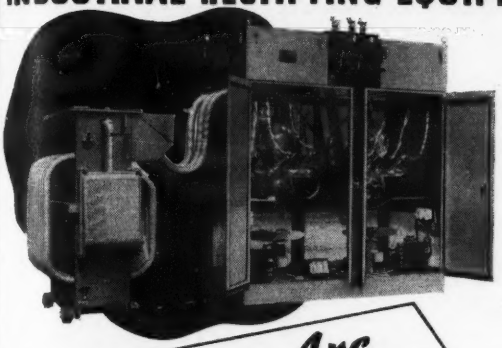

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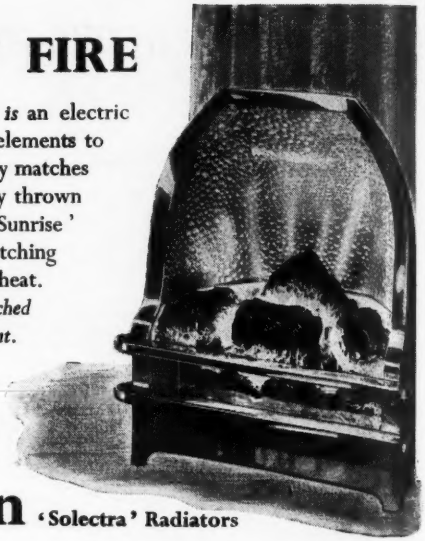

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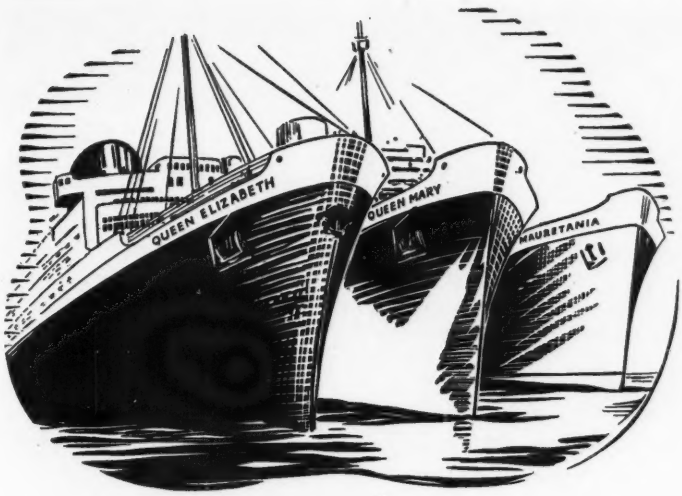

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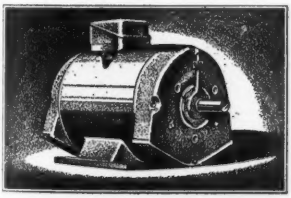

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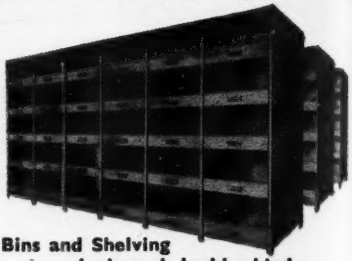

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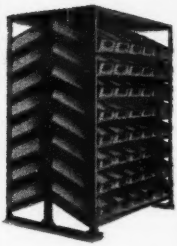

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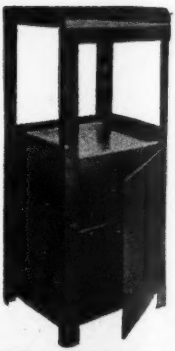

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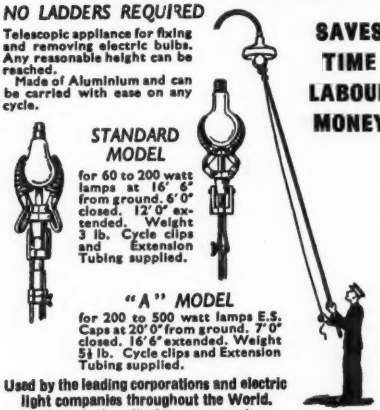

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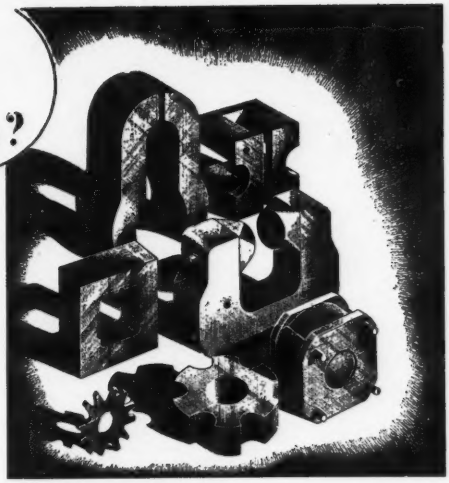

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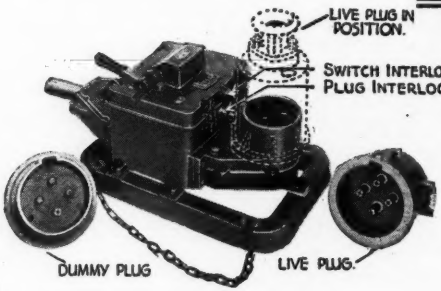

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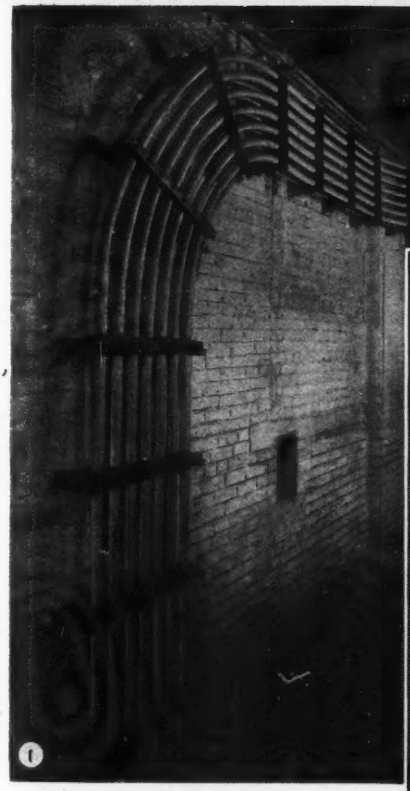

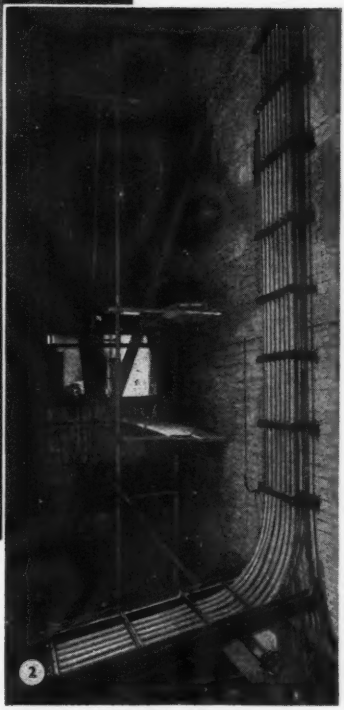

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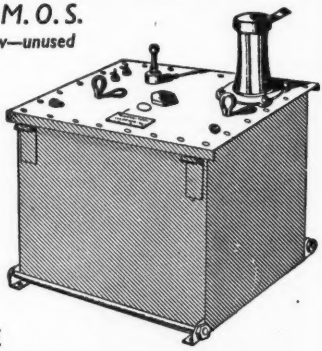

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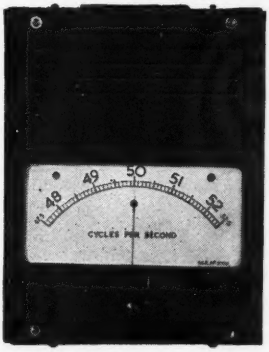

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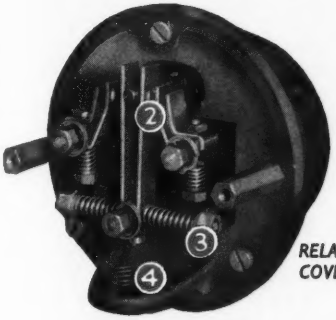

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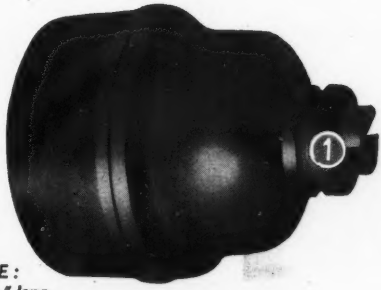

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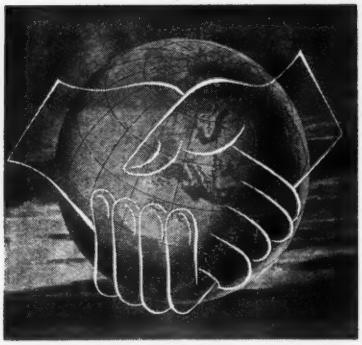

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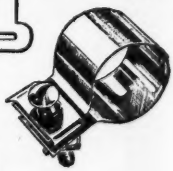

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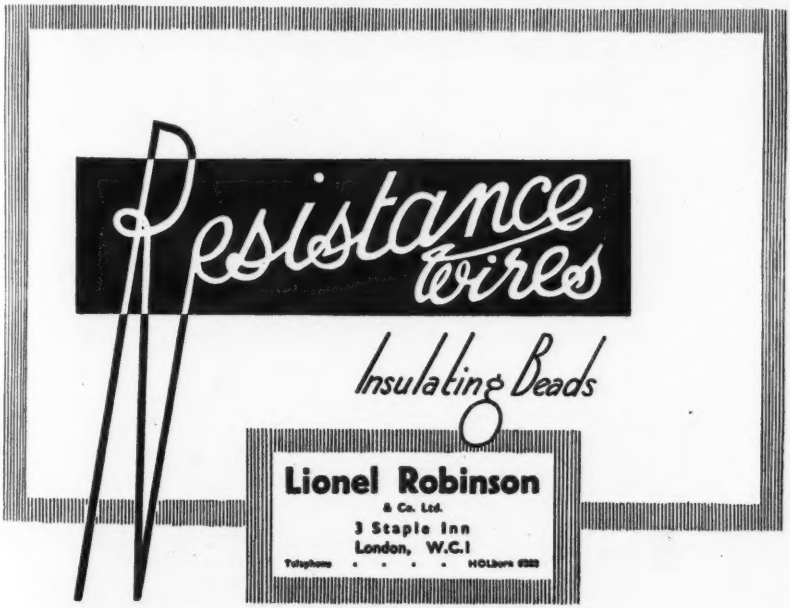

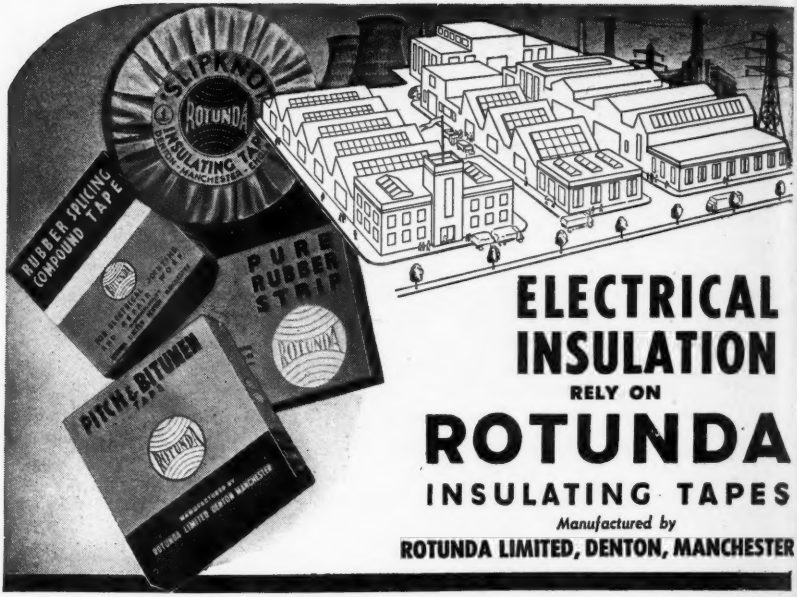

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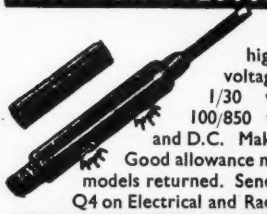

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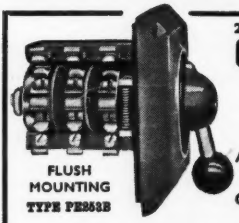

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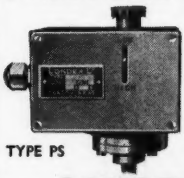

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